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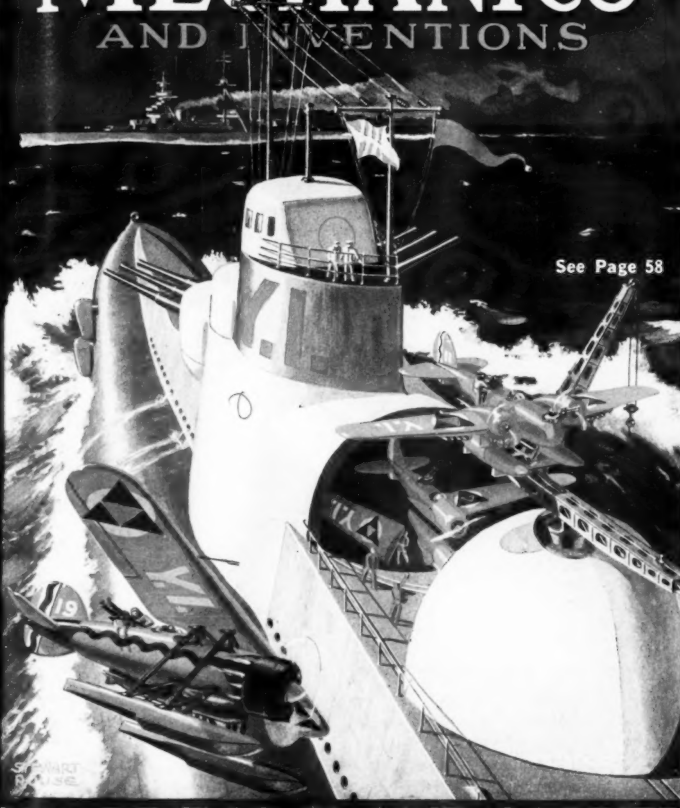

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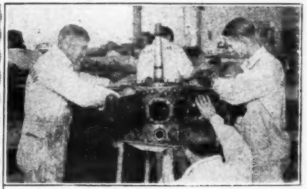

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MODERN MECHANICS AND INVENTIONS

JUNE, 1930

PRICE 25 CENTS

This magazine is not connected with or associated with any other magazine of a scientific or mechanical nature.

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Dick Grace, hero of countless movie airplane crack-ups, tells in next month's Modern Mechanics how he weakens vital parts of a ship he intends to crash so that it will crumple into kindling with the least possible danger to its pilot—how he guards against a broken neck with a special shock pad around his forehead — how he builds a protective framework of metal tubing inside the cockpit. Read Dick Grace's own story in the July issue, on sale June 1.

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Listed below are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers concerning their departments. Address them in care of this magazine, Robbinsdale, Minnesota.

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Published monthly by Fawcett Publications, Inc., at 501 7th Ave. So., Minneapolis, Minnesota. MODERN MECHANICS AND INVENTIONS entered as second class matter September 20th, 1928, at the Post Office, Minneapolis, Minnesota, under the act of March 3rd, 1879. W. H. Fawcett, Publisher; Roscoe Fawcett, Managing Editor; Jack Smalley, Assistant Managing Editor. Copyright 1930. Ray Ryan Advertising Manager: Chicago office, 25 East Wacker Drive (Phone State 2955); New York office, 52 Vanderbilt Avenue, Room 606 (Phone Vanderbilt 8460). All manuscripts should be addressed to our editorial office at Robbinsdale, Minn. Manuscripts will not be returned unless accompanied by return postage. Advertising forms close on the 20th of the third preceding month. Price 25 cents a copy; $2.50 a year in the United States and possessions. Other Postal Unions, $3.00 per year. Printed in U. S. A.

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He sent us a coupon just like the one at the bottom of this page—he considered carefully the information that coupon brought him—he enrolled for LaSalle training in Accounting—and he began climbing—slowly but steadily.

Today he is Assistant Auditor General of one of the world's great railway systems—and the future is bright.

"Good-bye time clock, I'm my own boss now"

Down in southeastern Ohio, a young bank teller toiled away in his cage, looking forward along the usual slow path of advancement—a path especially slow for the man who has no special training and only loyal, routine service to offer an employer.

Today, this man, yet in his early twenties, owns a flourishing public accounting business with four other accountants on his staff, has the respect and liking of the leaders of his community, is his own boss, and has an income of which men much older than he would be proud. The LaSalle coupon started him.

Would you like to join this profitable profession?

You can—if you have the ambition and the will to prepare. But the first step is to get the facts—send the coupon.

Our new illustrated booklet, "Accountancy, the Profession that Pays," will open up to you a complete view of the accounting field—its problems, opportunities—will show you how its leaders work, what they expect of its future, what they demand in the men and women who are to become their co-workers and successors. In addition, it gives full information about our training in accounting, so that you may know and estimate it for yourself.

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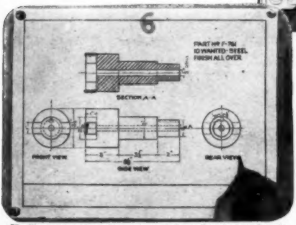
The L. L. COOKE PICTURE

NOW the wonderful Big Pay Opportunities that Drafting offers are open to you as never before. Now, with the amazing new L. L. COOKE "See it — Do it" Training, you can become a full-fledged Engineering Draftsman in a surprisingly short time — and you don't need artistic ability nor High School education to do it. Many fellows no smarter than you qualify in a few months for Big Pay Jobs this new quick way.

STEP BY STEP YOU SEE IT—

It's just as easy as it looks in the pictures here. You go along step by step. You SEE IT done — and you DO IT yourself. Pictures guide you — actual movie-photos of your instructor's hands doing drafting show you every move of pen or pencil. Yet it's not a mere copying course. (You can't learn by copying). The pictures show you HOW to do it, and the simple, interesting text explains WHY it's done. At the same time you learn all about mechanics, engineering, shop-practice and everything a draftsman must know. In other words, you learn **Drafting,** from A to Z!



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Everyone knows that Drafting is the Open Door to the Big Pay Jobs in the Mechanical World — the jobs that pay $60 to $100 a week and up — the jobs you **can't** get unless you're a Draftsman. Why not get into this great work now that this Training has made it so easy — why put off any longer the success other fellows like you now enjoy — why don't you, too, jump into Drafting this quicker, surer way?

STEP BY STEP YOU DO IT!

Decide today to get ready for this Big Pay work. But don't sign up for any Drafting Course until you've found out all about this highly simplified "SEE IT — DO IT" Method. Get the Big FREE Book that explains all. Read about the wonderful big outfit of tools, instruments, drawing board, etc., furnished without extra cost. Read about the Nation-wide Job Service, the great Earn-while-Learning Plan, the famous Money-Back-Agreement, and the brilliant future that awaits you in Drafting when you've learned Drafting this fascinating, thorough way. Mail the coupon NOW!

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Send me your book "Draw Big Pay in Drafting" and tell me more about your "See It — Do It" Method. This does not obligate me in any way.

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McSweeny Electrical Shops,
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More to Come

Radio now offers ambitious men the greatest Money-Making Opportunity the world has ever seen! Hundreds of trained service men are needed by radio dealers, jobbers, and manufacturers!

A "trained" Radio "Service and Repair" man can easily make $40 to $50 a week, and it's very common for a trained man with experience to make $75 a week and up.

BIG MONEY for spare-time Radio Work is easily made in every city and village. You can now qualify for this Big-Pay Work quickly through R. T. I. Get the Big Money Now and go up and up in this Big Pay field. The Radio industry calls for More Men, and R. T. I. supplies what the industry wants you to know.

Supervised by Radio Leaders

R. T. I. training is prepared and supervised by prominent men in radio, television and talking picture engineering; distributing; sales; manufacturing; broadcasting, etc. These men know what you must know to make money in Radio. You learn easily in spare time at home with the R. T. I. wonderful combination Testing Outfits, Parts, Work Sheets, Job Tickets. It is easy, quick and practical — covers everything in Radio — Television — Talking Pictures and the latest in Television.

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ALL YOU NEED is the ambition and the ability to read and write. The Radio industry needs practical trained men. Remember, R. T. I. makes it easy to earn spare time money while you learn at home.

More to come

THE MEN who get into this Big-Money field now will have an unlimited future. Why? Because this billion dollar Radio industry is only a few years old and is growing by leaps and bounds. Get in and grow with it. $30 to $25 per week and more is easily made in spare hours while you are preparing for Big Money. TELEVISION, too, will soon be on the market, so the leaders say. Be ready for this amazing new money-making field. Remember, R. T. I. "Sin I" home-training gives you all the developments in Television and Talking Picture Equipment, together with the complete Radio training.

Warning

Do not start R. T. I. training if you are going to be satisfied to make $15 or $20 per week more than you are now. Most R. T. I. men will make that much increase after a few weeks. There is no reason to stop short of the Big Money Jobs or the Big Profits in a spare time or full time business of your own. No capital needed. Get started with R. T. I. now. Make money while you learn at home.

R. T. I. Book Now FREE

The thrilling story of Radio, Television and Talking Pictures is told with hundreds of pictures and facts — itshundreds of big money jobs and spare time money-making opportunities every where. Send for your copy now. USE THE COUPON.

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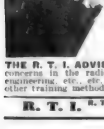
Twenty years Radio experience. First to establish two-way communication with Europe. Former Traf. Mgr. of American Radio Relay League. Lieut. Com. U.S.N.R. Inventor, designer, consulting Radio engineer.

Assisting him is the R. T. I. Advisory Board, composed of men prominent in the Radio Industry. These men know Radio and will help you succeed in their field.



THE R. T. I. ADVISORY BOARD. These men are executives with important concerns in the radio industry — manufacturing, sales, service, broadcasting, engineering, etc., etc. They supervise R. T. I. Work Sheets, Job Tickets, and other training methods.

R. T. I. TRAINS YOU AT HOME FOR A GOOD JOB OR A PROFITABLE PART TIME OR FULL TIME BUSINESS OF YOUR OWN

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Oliver L. Parks, Vice-President and General Manager of Parks Air College. Member, Board of Directors, St. Louis Aviation Corporation. Mr. Parks has been closely identified with aviation development for the past 7 years.

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WHEN you enroll for training at Parks, you place your future in the hands of men who have attained *undisputed national leadership* in aviation—men who are known and respected throughout the aviation world.

Parks Air College is a division of the Detroit Aircraft Corporation, a giant industrial organization which includes five of America's finest aircraft factories.

Parks—*above all other schools*—is best able to give you the kind of training you want. Do you aspire to a private, limited commercial or transport pilot's license? Come to Parks—here you will find a large staff of the most capable instructors, a great fleet of *over 30 training ships* and the most *thorough* and *complete* instruction courses imaginable. Come to Parks if you want to become an airplane and engine mechanic—we give you the same *quality of instruction* as out pilot students receive. *All courses are under Mr. Parks' personal supervision.*

Wherever you live, it will pay you to come to Parks for your training. Don't gamble with your future. Your best chance of success lies in entrusting your training to this great, time-tried institution. Send coupon for details.

Parks Air College was one of the first to be licensed by the U. S. Department of Commerce as a fully accredited transport school

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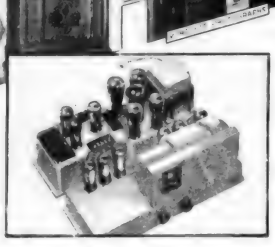
Only To First 1000 Students

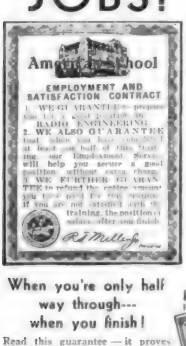
Your BIG CHANCE To Get Into RADIO



Here's the opportunity you have been waiting for—to get into RADIO with the kind of backing and training that will push you ahead of the thousands who only have a limited "practical" experience. Now that the Radio industry has expanded into new fields like Talking Movies—Television—and Commercial wireless—now that *leaders* must be trained for the future—now that manufacturers and big dealers and Broadcasting stations are calling for men with a complete Engineering training—

—*now that we are able to promise jobs to every man we train*, the American School announces the outstanding home study course in Radio Engineering—and to quickly start 1000 ambitious men in careers as Radio Engineers, Superintendents, Broadcasting Operators and other important positions—we offer training of University standard at a big reduction in cost and on small monthly terms.

JOBS!



What An Opportunity

With 29,000,000 wired homes in the U. S. and only 5,000,000 all-electric sets in use—with 5,000,000 old-style battery sets to service with the rapid growth of talking movies and the development of television—men will wish 10 years from now they had "got in on the ground floor" today.

You know there is no shortage of repair men, screw-driver mechanics and soldiers today. But because so few men are willing to go to the trouble to get a real *Engineering training*, here we say is a wonderful opportunity for you.

Get Your Training From Duncan and Drew of R. C. A.

—and other leaders in the Radio industry. Chartered as an educational institute, not for profit, 44 years. The American School with a tradition for *quality training* has decided to set out to surpass the courses of *all other schools* and *institutions* by including the advanced engineering branches, by introducing the latest inventions in the entire field.

Here is a course complete enough to look with a real development—and yet simplified so any man with grammar schooling can master it.

When you're only half way through--- when you finish!

Read this guarantee—it proves superior training. Because it assures you of a *satisfactory position and salary*, or money refunded. Notice particularly that you need not wait until you finish to cash in—*we help you get a good job when you're only half way through.*

THE AMERICAN SCHOOL

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Please send FREE and without obligation Radio Book and your offer to help me get a Drafting job when only half-way through the course, and after I finish.

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There is a JOB for You Here...

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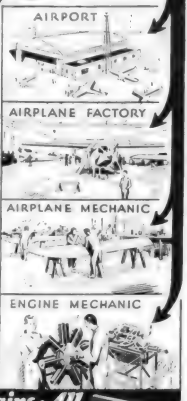
MAJOR
R. L. Rockwell

Will Train You AT HOME, and Until You

Get a Job Paying You $300 to $400 a month

Major Rockwell—famous world war flyer, is offering to train a limited number of ambitious men who want to get into aviation and get one of the big pay jobs that aviation offers.



JUST 12 SHORT WEEKS

All you have to do is devote about an hour or two a day to my Home Study Extension Course and in 12 weeks you will be mastering the principles of Ground Training and be prepared to qualify for and accept a big pay job in this branch of Aviation. If you want to fly, my Home Study Course teaches you the principles of flight. When you have completed the ground training I will arrange for you to take your flying instructions at any licensed airport near your home at special reduced rates. Or if you want you can come here to Dayton and get training at one of the finest and best equipped airports in America. No matter where you learn to fly you can qualify for a pilot's license and a high pay job in passenger lines, mail service, and other important branches of flying.

Advance Education or Experience Unnecessary

You don't need a high education to master my course. My home course is thorough and complete. Everything is so clearly explained, with easy to-understand text and pictures, that in a few short months you will be able to grasp every fundamental principle of Aviation ground work and get a start in Aviation qualifying for any important aviation job paying $300 to $400 a month. My Home Study Course will give you all the knowledge necessary to pass the government's written examination for a license.

How I Help You Get Your Job

Because of my experience in Aviation and knowledge of the work, I am in touch with large employers of trained aviation men who are constantly seeking help. Thus I am able to help my graduates get the aviation job they want at big pay. These employers prefer Rockwell Trained Men.

Money-Back Agreement

I am so sure that you can learn Aviation with my help and step into a big aviation job that if you are not satisfied when you have finished my course, I agree to return every penny of your tuition. Read my money-back agreement. Act now while my special offer lasts. Rush this coupon to me for a copy of my famous free book.

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Dear Major: Please send me FREE and without obligation a copy of your famous book on Aviation; the details of your no-risk plan; also your special tuition offer.

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Town ..... State ..... Age .....

THE SHOP MAIL BOX

A column of gossip dispensing news and chatter, conducted by Andy, Modern Mechanics' own Grease Monkey. If you're interested in what readers are thinking and saying, compare your hunches with these!

LOOKS to us as though there were a whole lot more outboard motors banging about on every lake in the country than there were last year. I'm all for 'em. Nothing is quite as much fun, except maybe the thrill of flying. Nothing is quite as safe or calls for as much skill as the racing of these little buggers with their featherweight boats. We've got plans for a real racer coming up for another issue.

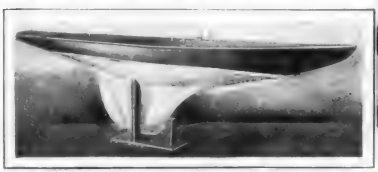
All samee, many men want to go from the somewhat skittish and temperamental running of the lightweight sterndoor stem winders to the solid comfort of a good inboard motor boat. We've got a dandy 18 footer for a Ford motor on the ways and she'll be along pretty quick.

And while on the subject of boats, look at the lovely model below. Sweet sailer, this little R boat. Built by A. R. Brown of Melrose Highlands, Mass., she was. Mr. Brown runs a model yachting paper and will be glad to hear from all Double M fans (versatile crew, by Joe!) who are model boat wise.

William Atkin, original designer of small yachts, friend of several of Double M staff, is doing us another how-to-build for the early fall issues.

MODERN MECHANICS is proud to have discovered Billy to the mechanical magazine field. He'll be a favorite with you, and a steady contrib. Other mags are beggin' for his work, the eds tell me, and little Andy prognosticates other mags will have

(Continued on page 24)



Mr. A. R. Brown is the builder of this fine, sweet sailing model "R" boat. She is one meter in length, or about 39 inches long, and wins races consistently. She is steered automatically by sail.

MEN!

Get Your Copy of

How to get in the Radio Industry

J. E. SMITH, Pres.
NATIONAL RADIO INSTITUTE

I showed these men how to get like *these*

If you are earning a penny less than $50 a week, send for my book of information on opportunities in Radio. It is free. Radio's amazing growth is making hundreds of fine jobs every year. My book shows you where these jobs are, what they pay, how I can train you at home in your spare time to be a Radio Expert.

You have many jobs to choose from

Broadcasting stations use engineers, operators, station managers and pay $1,800 to $5,000 a year. Manufacturers continually need testers, inspectors, foremen, engineers, service men, buyers for jobs paying up to $15,000 a year. Shipping companies use hundreds of operators, give them world-wide travel with practically no expense and $85 to $200 a month besides. Dealers and jobbers are always on the lookout for good service men, salesmen, buyers, managers and pay $30 to $100 a week for good men. Talking Movies pay as much as $75 to $200 a week to men with Radio training. There are openings almost everywhere to have a spare time or full time Radio business of your own—to be your own boss. Radio offers many other opportunities. My book tells you about them.

Now 8 Outfits give you Extensive Practical Radio Experience

With me you not only get the theory of Radio—you also get practical Radio experience while learning. You can build over 100 circuits—build and experiment with the circuits used in Atwater-Kent, Majestic, Crosley, Eveready, Stewart-Warner, Philco, and many other sets. These experiments include A. C. and screen grid sets, push pull amplification and other late features. When you finish my course you won't need to take "any old job" just to get experience—you will be trained and experienced ready to take your place alongside men who have been in the field for years.

Back view of 5-tube A. C. screen grid tuned Radio frequency set—only one of many circuits you can build with the parts I give without extra charge.

I Will Train You at Home in your Spare Time

Hold your job until you are ready for another. No need to leave home. All I ask is part of your spare time. I have doubled and tripled the salaries of hundreds through my practical home-study training. You don't have to be a high school or college graduate. My course is written in easy, simple terms that most anyone can understand.

My Course Includes Talking Movies, Wired Radio, Television

My course is up-to-date with Radio's latest uses and improvements. It includes Radio's application to Talking Movies, Television and home Television experiments, Wired Radio, Radio's use in Aviation, in addition to fitting you for many other lines.

Money Back If Not Satisfied

I will agree in writing to refund every penny of your tuition if you are not satisfied with my Lessons and Instruction Service when you have finished my course. This agreement is backed by the Pioneer and World's Largest organization devoted entirely to training men and young men by mail, for good jobs in the Radio industry.

Find out what Radio offers you Get My Book

This book gives the facts on Radio's opportunities and the many features and services of N.R.I. training. It gives 100 letters from students who have proved that my methods are successful. Get your copy today. There is no obligation.

J. E. Smith, *President*
National Radio Institute, Dept. OFH
Washington, D. C.

Seldom under $100 a Week

"My earnings in Radio are many times bigger than I ever expected they would be when I enrolled. In November I made $577, December $645, January $465. My earnings seldom fall under $100 a week. I merely mention this to give you some idea of what a Radio man can do who has the training."

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$3000 a Year in Own Business

"I cannot give N. R. I. too much credit for what I have been able to do in Radio. I can safely say that I averaged $3000 a year for the past three years. I am in the Radio business here. Any man who really wants to advance cannot go wrong in Radio. There is certainly a lack of trained men."

Fred A. Nichols,
P. O. Box 207, Eaton, Colo.

THIS COUPON IS GOOD FOR ONE *FREE* COPY OF MY NEW BOOK

J. E. Smith, *President*,
National Radio Institute, Dept. OFH
Washington, D. C.
Dear Mr. Smith: Send me your book. I want to see what Radio offers and what you offer in Radio training. This request does not obligate me in any way.

Name.....

Address.....

City.....*State*.....

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If you have a useful, practical, novel idea for any new article or for an improvement on an old one, you should communicate with a competent Registered Patent Attorney AT ONCE. Every year thousands of applications for patents are filed in the U. S. Patent Office. Frequently two or more applications are made for the same or substantially the same idea (even though the inventors may live in different sections of the country and be entirely unknown to one another). In such a case, the burden of proof rests upon the last application filed. Delays of even a few days in filing the application sometimes mean the loss of a patent. So lose no time. Get in touch with me at once by mailing the coupon on the opposite page.

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Above is a view of my drafting and specification offices where a large staff of experienced experts are in my constant employ. All drawings and specifications are prepared in my offices.

NTS

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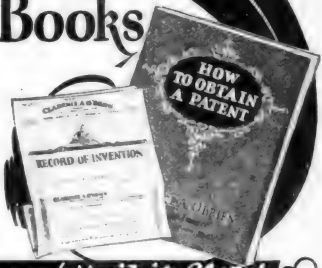

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Registered Patent Attorney

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I need 1100 more "partners" quick to start on my daring new Cash Pay plan. This announcement will probably "upset" the nation. Untold thousands will apply for these positions. If you delay, it may be too late. Right now—mail the employment Application below for this daring Cash Pay plan, offer of $13.00 worth of my goods (retail value) and the 20 secret words that may mean a fortune to you. Send no money. Just coupon. *This coupon is not an order.* You do not pay anything for this offer. *Nothing will be sent C.O.D.*

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The Health-O Quality Products Co.
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Curtis W. Van De Mark, President
The Health-O Quality Products Co.
Dept. 2034-FF, Health-O Bldg., Cincinnati, Ohio.

Dear Van: I hereby apply for position as "partner" in my town to start on your new cash pay agreement. Send offer of $13.00 worth of products (retail value) and written guarantee. Also tell me how I can make money saying the 20 magic words that make fortunes. *This is not an order—send nothing C.O.D.* I risk nothing.

Name .....

Address .....

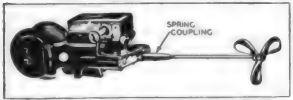
City ..... State .....

Andy, Shop Mail Box Columnist, Tells You About Light Airplanes

(*Continued from page 16*)

to prevail on Bill to sandwich in a design or two to keep up to date.

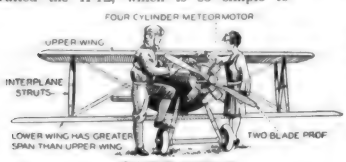
Do you know that when the editors of MODERN MECHANICS want a story they send out a cable or wire to the proper correspondent, and wham!—no matter what part of the world the story breaks the scribe is doing the leg work that results in the yarn you read next issue? I know dinged donged little about editin' and it always gives me



How-To-Build-It book contains a radio battleship article. This would make a good driving motor for the model. Note the spring coupling.

a kick to see the original story of some feat like Barnaby's cutting loose in a glider from the Los Angeles come out in his own words in Double M after all the newspapers have been able to get are the shots of the job. Heh! Heh! Three point deadstick landings everytime!

Lots of mail has come in in the past few months asking for the address of the Irwin Meteorplane Co. To the best of our knowledge they are located at Sacramento, Cal., but no mail has been answered of late. Incidentally, only two planes to my knowledge have ever flown satisfactorily with the ordinary V twin motorcycle engine. One is the Meteorplane, and the other is a design by Dwight Huntington, a crackerjack airplane engineer, who designed a monoplane called the H-12, which is so simple to



Here is a special Meteorplane, Irwin X-4 powered. Similar ships have flown with the V twin cycle engines.

build it'd make your head ache. We've got our nose on the scent of this design, which should prove a "natural" if we can get it. Keep your eyes on the newsstands, and when you see it published, buy it quick, because copies of the design will be scarce as hen's teeth one month later! Just orophesyin'—that's me.

Listen to this for a letter, Gang:

Battle Lake, Minn.

Dear Sirs:

I like the features in the magazine, and I like to build things too. Nix on the airplanes. They're dangerous. Nobody builds them, anyway. I like best of all outboard motors. I have a Johnson 16 and can do 35 miles easy with my hull. Why not a boat department?

SOL HEIBERG

Well, that's something I can't let go unchallenged, Sol, old chicken. Over four hundred gliders have been built from M-M plans, and heaven knows how many lightplanes. Ed Heath alone has sold 25 complete ships in the last year, and over 2,000 sets of parts for Parasols. I have no figures

from the motor men or other plane builders, but plenty of Henderson and Lawrences and special jobs have been built—and as for safety, do you know that all Ed Heath had to do to get an Approved Type Certificate was to put an extra mag on the Heath motor? I sympathize with the boat department idea, but wouldn't you rather see a real, honest-to-goodness design every other month or so than a bunch of stuff you'd lose interest in in winter time? I think so, and so do the editors, Sol. Anyhow, you have to go a long way to beat the designs that MODERN MECHANICS publishes, eh?

Lindbergh's gliding was done in a ship exactly like the Bowlus Glider which was carried in the January, 1930 issue of M-M. Although the ship at that time had been built and flown in common with every other design published in the mag, it was discovered that the plans the writer sent had not been checked and so publication of them was stricken from our schedules. Most of the gliders built to M-M plans are the Northrop type primary trainer published in the 1930 FLYING MANUAL.

(Continued on page 26)

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Andy Introduces a New Friend and Hints at Great News Next Month

William Atkin has a host of friends among boat wise men who know of his reputation as a yacht designer.

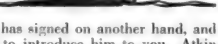
OFF here to port, my friends, is an old friend of boat lovers. As previously mentioned, MODERN MECHANICS discovered Bill Atkin to the field of mechanical magazines, and Billy is doing us a mighty nice story on a little cruisin' craft. What with Chas. Hall, Philip L. Rhodes and Sam Rabl, old Double M is set in top notch position to give you boat stuff that won't insult your intelligence. It'll be real he-man stuff as it has in the past, and the going will be good! Last January we suggested that Billy get goin' on a small deep water cruising sloop, and it is in the office now, ready to follow such salty articles as Sam's *Sunray* story this issue. Here's a 2sp. from Billy, who has designed hundreds of boats that are now banging around in all parts of the world:

Modern Mechanics:

I appreciate your writing me about the article for Modern Mechanics and I would be very glad to do this for you.

A boat about 18 ft. or perhaps 7 ft. beam and between four and five ft. draft would make an excellent little auxiliary. It could be powered with a small single cylinder engine which I think would be best, if of the inboard variety. Rigged with a jib headed mainsail and single jib she would be inexpensive to build and to operate . . . If this is satisfactory to you I would be glad to get at the thing so as to have it ready.

Sincerely,
WILLIAM ATKIN.



So M-M has signed on another hand, and we're glad to introduce him to you. Atkin has designed everything from model yachts to hundred foot yachts for the roaring forties. You'll like his stuff.

Next month we'll introduce one of the country's best lightplane designers, and make an announcement, gang, that'll set your hair on fire! It's about airplanes. And cars, and motors of all kinds, and boats and all kinds of electricity. Keep yer eye peeled!

Chips from the editor's workbench: Col. Miller's breathlessly absorbing yarn on the German big guns appears here for the first time in any magazine. The complete story is right from Col. Miller. The man who divulged the information is wanted in Germany for high treason. The Allies are glad for the work Col. Miller has done in revealing the secrets of the largest gun ever built. Incidentally it is the largest internal combustion engine ever built. Single cylinder at that, and 9,000,000 horsepower!

Professor Kalmus's story on technicolor is the personally told tale, done in third person, of this romance of American industry. First complete story to be published! How'd you like to be Omar Niergarth, marooned in the Everglades for 8 days after a crackup? (See Major Arnold's yarn on page 69, this issue.) You'd never think that scientists would make a lengthy, learned study of baseballs, would you? I whistled when I found Dacy's yarn this issue, tellin' me how Uncle Sammy plays Laboratory Baseball.

What do you think of this scribe's ideas?

Big Timber, Mont.

Editors, Modern Mechanics,

Dear Sirs:

Why don't you print an advertisement or something behind (on the back side of) the entry blanks to Win Your Wings Contest? Some of us Mag fans hate to mutilate our "good old books."

None of us fail to get our Subscription Expired notices in magazines that just slip 'em in loose, why not slip in entry blanks loose?

Yours truly,
L. B. LARSON.

We claim that's a good suggestion, and the accounting department is busy preparing facts and figures on the efficacy thereof for Captain Fawcett to decide on. Maybe we can use this idea, but whether or no, ideas of all sorts are mighty welcome.

(Continued on page 34)

LOOK—Miss Nobody thinks she can play someone whispered

—but when she sat down at the piano...

HOW wonderful it all was! Eileen had never expected to be asked to Grace Williams' party. Grace Williams—the leader of the most exclusive set in town. It was like a dream!

Eileen was thrilled beyond words—yet so frightened. Would she feel out of place in such exclusive society? Well, she had already accepted Bill Gordon's invitation, and now she'd have to go through with it.

That night Bill called for her. "You look positively adorable," he told her. Eileen knew that Bill was proud of her—but how would the others feel about her?

The party was in full swing when they arrived. Everything stopped while Eileen was introduced. She realized she had never felt more uneasy in all her life. But that was only the beginning. Later as conversation lulled, Eileen felt that everyone's eyes were on her. Oh, if this evening would only end!

And then it happened! It was while they were playing bridge. "Who is that girl with Bill?" she heard someone whisper.

"I never saw her before. Seems nice enough but nobody of importance, I guess," came the reply.

Eileen blushed. So that's what they thought of her! Suddenly she grew indignant. She'd show this smart set a thing or two. Soon the bridge tables were pushed away.

"Where's Jim Blake tonight?" someone asked. "If he were here we could have some music."

"Jim had to go out of town on business," came the answer. Here was Eileen's chance. Summoning all her courage, she said somewhat timidly:

"I think I could play a little if you're not too critical."

There was an embarrassing moment of silence. Eileen promptly became panicky—but realizing that she had to go through with it, she sat down nervously at the piano. Hesitantly she played a few chords—then broke into the haunting strains of "The Pagan Love Song." Her listeners sat spellbound as her fingers skipped lightly over the keys. Never had she played with such inspiration—such complete confidence in herself.

It was almost an hour before they permitted her to rise from the piano. As Eileen stood up, she found herself the center of an admiring group.

"Why, Eileen, I never knew you could play a note!" Bill exclaimed.

Well, I have really only been playing a short while," she answered.

"Why, you play as if you had studied for years. Who was your teacher?" someone asked.

"I had no teacher," Eileen replied.

"Well, how in the world did you ever do it?" they asked.

"It's a secret," said Eileen. And no amount of teasing would make her disclose it.

For Eileen, this night was just the beginning of a new world of pleasures. She became one of the most admired girls in the smartest of society. And all because she found this new secret to popularity.

Later Eileen told Bill her story.

I Taught Myself

"You may laugh when I tell you," Eileen began, "but I learned to play at home, without a teacher. I laughed myself when I first saw the U. S. School of Music advertisement. However, I sent for the Free Demonstration Lesson. When it came and I saw how easy it all was, I sent for the complete course. Why, I was playing simple tunes by note from the start. It was just as simple as A-B-C to follow the clear print and picture instructions that came with the lessons. And do you know, it only averaged a few cents a day!"

* * *

This story is typical. The amazing success of the men, women and children who take the U. S. School of Music course is largely due to a newly perfected method that really makes reading and playing music as easy as A-B-C.

First you are *told* how to do it, then a picture *shows* you how, and then you do it yourself and *hear* it.

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$15 a Day

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Yes—I'll give you an opportunity to start right in making $15 a day. I'll show you an amazing new way to get plenty of money to pay your bills, to buy new clothes, house furnishings, a radio, take pleasure trips, etc. Just send for the facts. It's a wonderful chance to start making big money immediately.

Van Allen Made $125 in a Week

L. C. Van Allen, of Illinois, $23-a-week oil company worker, mailed a coupon like the one shown here. Shortly afterward he reported profits of $125 in a single week! Gustav Karnath, Minnesota farm laborer, needed cash at once. I showed him how to make $20.35 *in just 5 hours.* Mrs. Eva McCutchen, of Oklahoma, tried my remarkable plan for getting quick money. Now she writes that she made $26.55 *the very first day.* Of course, some of my people make more than others. But these big earnings of a few of my Representatives show the wonderful opportunities. And my proposition to you now is *even better* than the one I gave these people.

No Course of Training Necessary

You don't need any capital or experience. You simply act as my Representative in your locality and look after my interests there. All you do is call on your neighbors and my established customers and take care of orders for my line of fast-selling Groceries, Toilet Articles and Household Necessities. They *must* order from you *because I never sell through stores.* You alone get the profits on all business from my customers in your locality.

SEND NO MONEY

FREE! - New Ford Tudor Sedan

NOW a contest. I offer a brand-new car free to producers as an extra reward or bonus—in *addition* to their large cash profits. Mail coupon for particulars.

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MAIL THIS NOW

Albert Mills, Pres., American Products Co., 5770 Monmouth Ave., Cincinnati, Ohio.

Without cost or obligation, tell me about your new proposition that offers a chance to make profits of $15 in a day. Also explain your FREE Ford Offer.

Name .....

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Your physician will tell you that hernia (rupture) is a muscular weakness in the abdominal wall.—Do not be satisfied with merely bracing these weakened muscles, with your condition probably growing worse every day!—Strike at the real cause of the trouble, and

WHEN—

The weakened muscles recover their strength and elasticity, and—

The unsightly, unnatural protrusion disappears, and—

You recover your vim, vigor and vitality,—your strength and energy,—and you look and feel better in every way,—and your friends notice the difference,—

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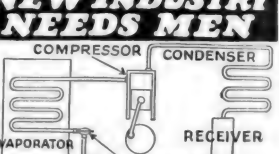

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Ever on the alert for new ways of helping our members make more money out of Radio, the Radio Training Association of America now offers ambitious men an intensified training course in Radio Service Work. By taking this training you can qualify for Radio Service Work in 30 days, earn $3.00 an hour and up, spare time; prepare yourself for full-time work paying $40 to $100 a week.

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We furnish you with all the equipment you need to become a RADIO Service Man!

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The Radio Training Association of America
4513 Ravenswood Ave., Dept. MM-6 Chicago, Ill.

The Radio Training Association of America
4513 Ravenswood Ave., Dept. MM-6

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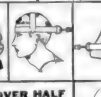

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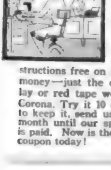

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Behind your training will be an institution specializing in Electricity, not a mere correspondence school — but a fully established college, recognized by the U. S. Government. Thousands of my graduates now employed in important positions with largest concerns in the country.

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In Radio, Television, Aviation, Automotives, Refrigeration, Moving Pictures, Super-Power Lighting — Electricity is the key. Big manufacturers are pleading for men trained in Practical Electricity. Salaries of $3,000 to $10,000 a year now are common. Here is a vast field for you, with unlimited opportunities. Now is the time. Start on the road of Electrical Training that leads to bigger pay — bigger opportunities — and SUCCESS!

Earn as You Learn

Cash in on your Electrical Training while you're learning. Many students report increased earnings, advancement, even while studying. Train in your spare time at home.

FREE! Send the coupon TODAY for *Free* illustrated catalog, "Practical Electricity — the Key to Success," and full details of Extension Division Training.

Complete Home Shop Laboratory Without Extra Cost!

Full-sized shop-laboratory equipment (not toys) worth $60.00, included with each course. Built on exclusive, patented Unit Board System. Makes fascinating sport out of shop work.

Learn by Doing!

No mere book on theoretical training, but actual work on real switchboards, motors, testing machinery and electrical equipment. You get training that is PRACTICAL right in your own home.

EXTENSION DIVISION, Dept. 48

SCHOOL OF ENGINEERING

Milwaukee, Wisconsin

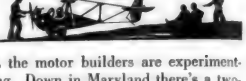
Please send me without obligation FREE illustrated catalog, "Practical Electricity — the Key to Success," and details of Extension Division training.

Name.....

Address.....

Letters From the Shop Mail Box

(Continued from page 26)



ALL the motor builders are experimenting. Down in Maryland there's a two-cycle expert who is an *expert*. Here is a letter for you!

403 Bosley Ave.,
Towson, Md.

Editor, Modern Mechanics,
Robbinsdale, Minn.
Dear sir:

I have been a reader of your Modern Mechanics for some time and have found special interest in your aviation sections.

For the last twenty years I have been carrying on research work on the small light weight internal combustion engine and believe my latest product would be of interest to your readers.

I am inclosing photos of this engine and would be glad to give you further data as to performance, etc.

As can be seen from photo it is a 90 degree, four cylinder, non-crank case compression two-cycle engine, scavenged with pure air and fuel injected after closing of exhaust port.

It is naturally a valveless motor and in this way valve operation losses are eliminated and the short overhaul time which go with them. It has hollow crank shaft with oil under pressure to all bearings and is made of a special processed aluminum alloy of high conductivity and specific heat which eliminates any cooling difficulties.

Displacement ..... 60 cu. in.
Horse power 26 at 2000 rpm; 34 at 2800
Fuel consumption at 2500 rpm .59 lb./hp.
Weight without prop. ..... 52 lbs.

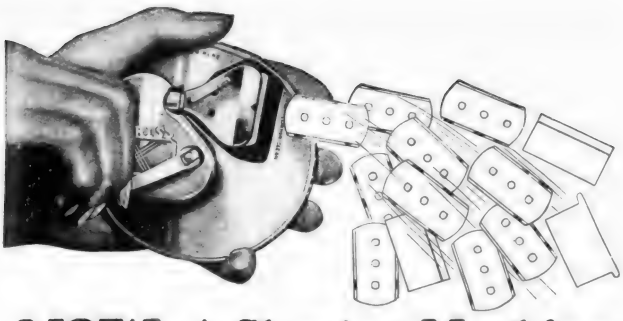
This engine was built as a small test unit for the larger type of engine but from calls already made believe there is a market for an engine of this size.

The engine idles and starts exceptionally and will not run in reverse direction.

Very truly yours,
W. B. ROBE.

Just about the time this letter from Mr. Robe came in, I got a letter from Sam Rabl, who you'll remember did the wonderful seaplane float story in the 1930 FLYING MANUAL, and Sam said he'd seen Robe's motor and that it was a sweetheart! We don't want to embarrass Mr. Robe, who is one of the Gang, by referring you to him, but if you know what 2 lbs. per h.p. in an aero motor means, you can appreciate what

(Continued on page 38)



NOW... A Shaving Machine That Ends Buying Razor Blades!

AT LAST! The invention every man has been waiting for—a device that practically ends razor blade expense! J. T. Main (Wisconsin) has already gotten 1,500 slick shaves from one old Gillette blade. E. L. Vinal (Oregon) hasn't bought a razor blade for two years. Thousands write letters like this. Millions of dollars are being saved by Kriss Kross users with this amazing machine that makes old blades like new—in fact often makes them keener than when new!

Unlike Stroppers

This wonderful device is far improved over ordinary blade sharpeners by an uncanny new principle that makes "perfect edge" an automatic certainty. It sharpens any blade (except Durham Duplex) in eleven seconds, and even a child can safely use it.

Just imagine what you could buy with the money you've spent on razor blades for the last ten years—and how much you can save the next ten—then you'll realize what a wonderful investment Kriss Kross is. But saving razor blades is only one of many Kriss Kross advantages. From now on, expect shaves that are 50% easier, cooler, quicker. No more tender, burning skin. No more tough, wiry beards or "missed" patches.

A FREE FORD
and
$5300 Profits

Become a Kriss Kross man. Win a free Ford and make $5,300 in a year like G. B. Loughren. Work full time or spare hours. No experience needed — we show you how to make money. Check bottom line in coupon below.

Sensational Offer

And now for my surprising offer. To introduce KRISS KROSS to those who have not yet seen it, I am giving with it Free a new kind of razor. Possesses remarkable features. Instantly adjustable to any shaving position. A flip of the finger makes it (1) T-shape, (2) straight (old style), (3) or diagonal (new wave). Gives a [illegible] instead of pulling stroke. Simply zips right through the toughest crop of whiskers and leaves your face [illegible] and cool. Made of [illegible] metal. All one connected piece—nothing to assemble or screw up. Comes with 3 special process blades and is entirely unlike anything you ever saw before!

Mail coupon now while this special offer [illegible]!

KRISS KROSS CORP.
Dept. E-3544
1418 Pendleton Ave.
St. Louis, Mo.

MAIL TODAY

KRISS KROSS
Razor Blade Machine

KRISS KROSS CORP., Dept. E-3544
1418 Pendleton Ave., St. Louis, Mo.

Without obligation, please send me illustrated description and full details of your special introductory offer on KRISS KROSS super stropper and FREE 3-way razor.

Name .....

Address .....

City ..... State .....

( ) Check here if interested in making money as authorized KRISS KROSS representative.

Magic

Learn at Home—by Mail
Easily! Quickly!

New! Different! Dr. Harlan Tarbell, Famous Magic Wizard, teaches you Big Tricks, Illusions, Stage Stunts, "Patter" and the Principles of Magic. You learn easily and quickly at home by mail. Earn $250 to $1,000 a month. Write today for free literature and details.

Astonish Your Friends

Gain that magnetic popularity that makes you the center of any crowd. Why envy others' skill? You can learn Magic yourself, quickly, easily—at home—by mail—during your spare time!

WRITE! Mail coupon now for free Magic literature telling all about the great Tarbell Course in Magic. *Get Our Low Prices and Easy Payment Plan.*

TARBELL SYSTEM, Inc., Studio A-135
1926 Sunnyside Avenue, Chicago, Ill.

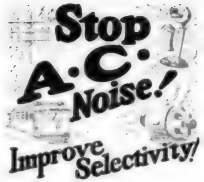
Tarbell System, Inc., Studio A-135
1926 Sunnyside Avenue, Chicago, Ill.

Gentlemen: Without any obligation send me your free literature and information all about your wonderful "Tarbell Course in Magic." Also tell me about your Low Price Offer and Easy Payment Plan.

Name .....

Address .....

..... Age .....



RADIO reception may be made much more enjoyable by plugging in a Falck Claroceptor between the light socket and your set. By blocking out the line interference noises, this wonderful device also helps selectivity and distance. Tested, proved. Thousands now in successful use all over America. No change required in your set. Only equipment of the kind. Compact size: 3" x 5½" x 2½". Made by pioneer radio manufacturer. At radio parts dealers, or write us for new free folder.

Falck **$7.50** (With Cord and Plug)

CLAROCEPTOR

Manufactured by
ADVANCE ELECTRIC CO.
Dept. M M—1260 W. Second St., Los Angeles, Calif.
JOBBERS AND DEALERS, GET OUR PROPOSITION

JOIN THE
GREY GOOSE GLIDER ASSOCIATION

Be a Pioneer in this Thrilling Red-Blooded Sport of the Sky

YOUR Membership Will Bring YOU

FIRST: Plans and Construction Data of the famous GREY GOOSE GLIDER—joint product of an Aircraft Designer, Builder and Military Aviator. You'll be surprised at the simplicity and low cost of this high performance Glider.

SECOND: A complete Course in Design, Construction, Maintenance, Rigging, and Inspection of Aircraft, prepared especially for Ass'n Members by the Chief Instructor of one of America's leading Flying Schools.

THIRD: Free Subscription to "GLIDING" the Ass'n Bulletin, featuring articles on Glider Development, famous German Soarers, and a Question Box to which Members are invited to send their aeronautical problems.

ACT NOW!

WRITE TODAY for further information. This is YOUR opportunity to do something REAL in Aviation—learn actual flying,—follow GLIDING as a sport or prepare yourself in a practical as well as theoretical way for an Aeronautical career.

Send Name, Age and Address to the

Grey Goose Glider Association
Applicants Dept., Box No. 91
Minneapolis Minnesota

Test This Amazing Money Making Invention FREE

Men, here's the most remarkable money maker of the age! A little automatic machine that makes old-style can-openers obsolete! Now just a twist of the wrist makes the dollars burn for you! So mail the coupon today for liberal FREE TEST OFFER.

UP TO $6 and $8 IN AN Hour Just Offering This $1,000,000 Can Opening Machine

NO more awkward stabbing and hacking with old-style can openers. No more danger of blood poisoning from gashed and lacerated fingers. For now a remarkable new invention banishes every old-style can opener to the scrap heap. Now a simple twist of the wrist opens any can in a couple of seconds. No wonder they all simply go wild over it. No wonder salesmen have sold to every house in the block and have made up to $8 in an hour.

WORKS LIKE A CHARM

This queer little device doesn't just chop a ragged hole in the top of the can. It cuts the entire top completely out, not off, clean as a whistle. The machine takes hold of the can opens it—flips up the lid so you can grab it and gives it back without any sharp edges to snag your fingers. You just put the can in the machine—turn the handle—and almost instantly the job is done.

SELLS ITSELF IN SECONDS

Everyone knows how women detest the dangerous old-style can opener. Imagine then, how they welcome this startling new method—this automatic way of doing their most distasteful kitchen task. Men, honestly I'm not exaggerating one bit when I tell you that not ten words are necessary to sell many of them. All you do is hand your demonstrator to your prospect and let her try it. She often sells herself in seconds— and you pocket a nice, fat profit. Yes really, it's just that simple and easy. That's why salesmen have made $75 to $150 a week.

OPENS ANY CAN IN A JIFFY

You just slip the can in the holder and turn the handle. Nothing complicated, nothing to get out of order. Opens any can, square, round or oval, in a few seconds. And, men, IT'S TRIPLE PATENTED, so there is no competition.

ACT QUICK FOR FREE TEST OFFER

I don't care whether you're an "old-timer" or just breaking in, some of the quickest, easiest money of your life is waiting for you now, right here. That's a mighty strong statement. But all I ask is a chance to prove it at my risk. I know this proposition will coin money for you with such speed that it will make your head swim. Territories are closing fast. The Free Test costs you nothing. Just mail me the coupon and I'll shoot you the most sensational dollar making plan you ever heard of. Mail it today. Right now!

OH BOY! HOW THE DOLLARS ROLL IN! $208 IN 24 HOURS

"Speeds products do everything that is claimed for them. I went to a small railroad town and sold 24 Speeds products in about 3 hours. In another instance I sold 31 Speeds on one street in 1½ hours. In 24 hours of selling I have made exactly $208."
John Neighbors, O.

1,000 SALES IN 93 DAYS

"I have now made 1,000 Speeds sales in 93 days, which is pretty good to start. The other day I sold 21 Speeds in less than 5 hours. Anyone can work up a nice business with Speeds; my earnings are now almost $1,000." R. W. Grafle, Ind.

REVOLUTIONARY NEW SHARPENER

Works like magic. Puts a razor edge on any knife or tool in a few seconds. Anyone can use it. Sharpens scissors, too. The coupon brings full details.

CENTRAL STATES MANUFACTURING CO.
Dept. G-2203
4500 Mary Ave., St. Louis, Mo.

Central States Manufacturing Co.,
Dept. G-2203, 4500 Mary Ave.,
St. Louis, Mo.
Rush me your Free Test offer.

Name .....
Address .....
Town ..... State .....
( ) Check here if interested only in one for your own home.

There's Big Money For YOU In RADIO

Television---Talking Movies

Leading Radio Engineers Train You At Home

to quickly enter these fields where **real opportunities** await you. Thousands of radio trained men are needed by Broadcasting Stations, Radio manufacturers, Radio distributors, Radio dealers, Talking Movie Companies, Aviation Companies and shipping companies. Salaries range from $1800 to $10,000 a year and more. Also splendid opportunities to go into profitable radio business for yourself. Be your own boss. Hundreds of School of Engineering graduates now hold important positions in leading radio and talking movie companies.

Complete Outfit Given

Full-sized equipment right in your home enables you to get practical training. You learn how to become a radio expert under the supervision of the radio engineers of the famous School of Engineering of Milwaukee from which station WISN and Amateur Station W9SO are operated. Training covers every branch of Radio including Television and Talking Movies.

Get the FREE Facts

Mail coupon below today for full FREE particulars of the Extension Division "Radio Training" with special Home Laboratory Full information as to how you can train for BIG EARNINGS IN RADIO, TELEVISION and TALKING MOVIES. No obligations. Please mention age.

EXTENSION DIVISION SCHOOL OF ENGINEERING,
163 E. Wells Street, Dept. 49 Milwaukee, Wis.

Extension Division, School of Engineering,
163 E. Wells St., Dept. 49, Milwaukee, Wis.

Please send me, without obligation, FREE particulars of the Extension Division "Radio Training", including complete Home Laboratory.

Name ..... Age .....

Address .....

Letters from the Shop Mail Box

(Continued from page 34)

he has developed. If Mr. Robe decides to build up a batch of these motors and they'd sell for about the same price as an outboard motor, this hombre feels sure there'd be a wide market for them.

Beautifully engineered is this Robe engine.

AND another interesting bit of news I just got hold of is the fact that the Storms Aviation Company are building a peach of a little monoplane with a Ford model T or A in it.

(Continued on page 40)

Airplane Blue Print FREE!

If you copy this sketch

If you are ambitious—want to earn big money as a draftsman—copy this sketch and mail to me. If I think you show talent I will send you, direct from my drafting room, a handmade Airplane blue print in three views with all main parts named and explained. Also FREE my two books, "My Pay Raising Plan," and "Successful Draftsmanship." They tell all about this fascinating profession and my working method by which I train you right in your own home. No matter what your schooling or what you are doing now—clip the coupon and learn what I can do for you.

LEARN DRAFTING

Earn Up to $100 a Week!

Automobiles, Electricity, Aviation, Building Construction—There are good jobs for draftsmen in these industries and in hundreds of others. Everything that is made—must first be planned and drawn in the drafting room. No wonder there is such a big demand for trained men. You can prepare for one of these fine positions—without leaving home—without quitting your present job. I'll give you practical training. I have trained men who are making $3,500 to 20,000 a year. There is a big future for draftsmen because you plan and supervise the work for others, or you go into business for yourself. Get started today. Copy the sketch and mail with coupon!

Engineer Dobe

I Train You At Home

No need to leave home or quit your job. Not only do I give you complete practical drafting room training at home—but I show you how to earn while you are learning—in a few short weeks after you start.

AVIATION DRAFTING AND DESIGNING COURSE

Included—No Extra Charge!

To meet the demands of the Airplane Industry for designers, I have prepared a complete course on aeroplane drafting. To those who act quickly, I will include this special training without any extra charge.

EMPLOYMENT SERVICE

After training you, I help you get a good job without charging you a cent for this service. Employers come to me for men because they know that Dobe Trained Men make good.

Get These Pay Raising TOOLS

I furnish you all tools AT ONCE, with my training, NO EXTRA CHARGE.

Engineer **DOBE**
1951 Lawrence Avenue
Div. A-235 CHICAGO

FREE

My Pay-Raising Plan

Mail coupon for this book that has started hundreds of men on the road to success.

MAIL THIS COUPON

If You Earn Less Than $70 a Week

Engineer Dobe, Div. A-235
1951 Lawrence Ave., Chicago

I am attaching sketch of Airplane. Send me the three-view blue print, as offered. Also your two books—all free to me.

Name ..... Age .....

Address .....

Town ..... State .....

"LINDY" BIG MUSCLE BUILDER

A *Genuine 10-Cable Chest Expander*

Makes Strong Virile Men

ONLY $5 POSTPAID
Worth $14.50

Read Our Liberal Offer

Health and Strength

Can be your—a month or two steady use of this exhilarating exerciser will put "pep" and vigor into you; makes men of 50 feel as active as at 20

For over 30 years famous men of Athletic history have used our Exercisers.

Guaranteed Best Quality Strongest on the Market

10 Cable Chest Expander, for upper body and course of Exercises, worth $5.00

Head Harness for spine, neck and head muscles, worth 2.50

Foot Strap, for foot, ankle and leg, worth.. 1.00

Grip Machine, for wrists, fingers and forearms, worth 1.00

Equipment for transforming Expander to Wall Exerciser and Instruction Course, "How to develop the entire body, etc.", worth..... 5.00

Total Real Value..... $14.50

BUSINESS and PROFESSIONAL MEN

Eliminate nervousness, irritation and constipation; build sinew, circulation and health on our graduated system of exercising.

Boys and Young Men

This is the era of **Strength**; professional wrestlers, boxers, ball players, etc., earn enormous salaries. You can be strong—be in position to take advantage of these wonderful opportunities. Start TODAY.

Clip This Adv. and Order Now!

LIND-HENDRICKSON CO.

321 Broadway, (133) N. Y. City

Originators and Mfrs. for 30 Years

Letters from the Shop Mail Box

(Continued from page 38)

We hear, as this goes to press, that Ed Heath has carried two people in a Parasol. A 125-lb., 16 year old lad hung onto one strut with his foot on the fitting, and hooked a leg into the cockpit. Ed gave 'er the gun and the little tin goose with all this parasite took off like a cyclone and climbed 450 feet a minute. A load of better than 300 lbs. total, plus a lot of parasite! Okay, Ed—okay! Now glimpse this with your optical equipment:

Keneally, Ore.

Dear Andy:

I've got a small auto run with an outboard engine. It uses cheap 20x2 airplane wheels, and has a disc power takeoff like the old Carter Car. I get variable speed by shoving the motor shaft in farther on the discs. The motor is water cooled and is mounted right on the dash in front of me. I'm sending the diagrams here and you can make a story on it.

DICK COLE

Dick is a real natural when it comes to novelties, and we've had how-to-builds before from this original, red-headed republican rooster who is such a favorite with M-M readers—but—never such a lulu as the one which makes a speed car out of a 6 h.p. outboard motor. She's on deck for the next cargo, me friends!

WHATEVER happens in the inner sanctums of th' well known and highly esteemed Dept. of Commerce aviation cookery, we hope to thunder that they don't put too heavy a taboo on this business of towing gliders behind cars. Just of late, it is rumored that all the clamps are down on towing, either from behind a car or from behind a plane. Now, says I, this is going too far. If we can bob sled behind cars, we ought to be able to flugzeug der gliders behind cars. There's no sense legislating improved methods to break necks. I'd prefer to see (and I know all the old pilots would too) freedom of individual action in regard to car-glider towing. A car offers less obstruction, less possibility of accident than a gang of tow runners. But I'd say nix on the plane-glider combine. That's murder, even for skilled men. Different climbing speeds, different stalling angles. Bad

(Continued on page 184)

Oil Heat Revolutionized

WONDERFUL INVENTION BURNS OIL NEW WAY!

Oil Heat Cut to Fraction of Present Prices

Now—after a hard winter—lifting heavy, dirty coal—chopping wood—turn your thoughts to NEXT Fall and Winter. DECIDE NOW to free yourself from drudgery! The LACO—the Ford of the Oil Burners—will do it for you!

The LACO is the WORLD'S LOWEST PRICE OIL BURNER. Nothing like it. **Burns AIR** with oil to smash fuel costs. SAVES by burning ALL the oil—waste, soot, grease eliminated. Works on the NEW PATENTED MINERAL WICK PRINCIPLE—only the LACO offers this advantage.

Hot Water All Summer—Warm Homes Next Fall!

The LACO Junior

Get this amazingly ECONOMICAL Oil Burner and enjoy the convenience of CHEAP hot water for all the home needs this summer. Fits parlor stoves, room circulators also.

THE COOK STOVE BURNER gives you the convenience and clean heat equal to CITY GAS but at a MERE FRACTION OF THE COST. Something you never before dreamed possible. Safer than gas as you can leave it on indefinitely and nothing happens. Get our sensational prices and full information.

7 SIZES • • • LOW AS $14

Fits any Furnace or Stove

A new heating system unnecessary. Installs easily in few minutes right into any hot-air, hot-water, steam or vapor-heat system—coal range, stove, or parlor heater.

Dealers Wanted Quick

We want rated men in territory still open—but also the man who will invest a small amount in demonstrators, then go out and sell. The season is just beginning—the opportunity represents $10,000 to $50,000 a year. Write us now.

Install Now — Payments Later

The smallest down payment—easiest terms. Special proposition if you order now.

Get Full Information

This Laco complies with all ordinances. Lasts a lifetime. Automatic control of safety—safer than ordinary kitchen range. Quiet. A marvel of economy and heating efficiency.

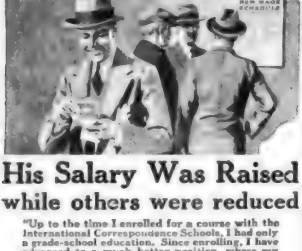
Write Now for Unusual Low-Price Introductory Offer

Please state kind of heating plant you now have. Get our sensational offer now.

Heavy Oils Burned by the NEW LACO MODEL F

No matter where you live or the kind of oil available there is a LACO that will heat your home at a cost so low that it just doesn't pay to use coal any more. The new LACO MODEL F ATOMIZING BURNER burns the heavy oils—any grade of fuel oil up to kerosene that is above 28 gravity on Medium Continent Oil or 24 West Coast Diesel Oil. Heats any size building or home. Deluxe model gives DOUBLE CONTROL of heat. Telechron Time Motor—no clock to wind—can be set so heat increases or decreases automatically to whatever temperature you want during the various times of the day or night. Safety absolutely controlled—ignition cut-off works on as little as two seconds fire lagging. Noiseless. Economical. Write for low introductory price.

Laco Oil Burner Co., 2010 Union Street, Griswold, Iowa



His Salary Was Raised while others were reduced

"Up to the time I enrolled for a course with the International Correspondence Schools, I had only a grade-school education. Since enrolling, I have advanced to a much better position, where my salary is nearly four times as much as I was making previously. I would not be able to hold my present position had I not taken your Course. Recently I received a nice increase in salary, while other men were being reduced."

There could be no better proof of the value of an I. C. S. course than that. It shows that the trained man is given preference over all others and paid more money, even in slack times, if his work deserves it. It shows that there are always busier, better jobs open for men who have the foresight to prepare for them in spare time.

Why don't you study and get ready too? We'll be glad to help you if you will only make the start.

Choose the work you like best in the coupon below; then mark it and mail it to the I. C. S. today. This doesn't obligate you in the least, but it will bring you information that will start you on a successful career. This is your opportunity.

Mail the Coupon for Free Booklet

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 2321-E, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the course *before* which I have marked X in the list below.

TECHNICAL AND INDUSTRIAL COURSES

☐ Architect	☐ Automobile Mechanic
☐ Architectural Draftsman	☐ Aviation Engines
☐ Building Foreman	☐ Plumber and Steam Fitter
☐ Concrete Builder	☐ Plumbing Inspector
☐ Contractor and Builder	☐ Foreman Plumber
☐ Structural Draftsman	☐ Heating and Ventilation
☐ Structural Engineer	☐ Sheet-Metal Worker
☐ Electrical Engineer	☐ Steam Engineer
☐ Electrical Contractor	☐ Marine Engineer
☐ Electric Wiring	☐ Refrigeration Engineer
☐ Electric Lighting	☐ R. R. Positions
☐ Reading Electric Blueprints	☐ Highway Engineer
☐ Telegraph Engineer	☐ Chemistry
☐ Telephone Work	☐ Pharmacy
☐ Mechanical Engineer	☐ Coal Mining Engineer
☐ Mechanical Draftsman	☐ Navigation ☐ Assayer
☐ Machine Shop Practice	☐ Iron and Steel Worker
☐ Toolmaker	☐ Textile Overseer or Supt.
☐ Patternmaker	☐ Cotton Manufacturing
☐ Civil Engineer	☐ Woolen Manufacturing
☐ Surveying and Mapping	☐ Agriculture ☐ Fruit Growing
☐ Bridge Engineer	☐ Poultry Farming
☐ Gas Engine Operating	☐ Mathematics ☐ Radio

BUSINESS TRAINING COURSES

☐ Business Management	☐ Business Correspondence
☐ Industrial Management	☐ Show Card and Sign Lettering
☐ Personnel Management	☐ Stenography and Typing
☐ Traffic Management	☐ English
☐ Accounting and C. P. A. Coaching	☐ Civil Service
☐ Cost Accounting	☐ Railway Mail Clerk
☐ Bookkeeping	☐ Mail Carrier
☐ Secretarial Work	☐ Grade School Subjects
☐ Spanish ☐ French	☐ High School Subjects
☐ Salesmanship	☐ Cartooning
☐ Advertising	☐ Illustrating
	☐ Lumber Dealer

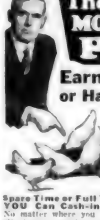
Name .....

Address .....

City ..... State .....

Occupation .....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada



There's Quicker, Bigger MONEY for YOU—in POULTRY

Earn $2000 to $5000 a Year or Have a Business of Your Own

Whether you want a job at good pay or a highly profitable business of your own—the Poultry Industry offers you more than any other. There's a shortage of poultry meat and eggs—a shortage of trained poultrymen. I'll train you quickly at home—to fill a good job in Poultry—and our FREE Students' Employment Dept. will help you get one!

Spare Time or Full Time YOU Can Cash-in BIG

No matter where you live—city, town or country—or what you do now, my proven methods will assure your success right from the start. I'll show you how to make from $2,000 to $5,000 a year—and UP! And, if you choose to start your own business, I'll show you how to make your tiny investment multiply itself automatically. What I've done for thousands of others—I can do for you!

FREE Book Shows Way to Big Pay and BIG Profits

Mail coupon below TODAY—for my Big NEW FREE Book, "How to Raise Poultry for Profit." My forty years of experience are yours. The Poultry Industry needs YOU. You need my book. Get it—and get in line for the BIG Money that's waiting for you in POULTRY.

Mail NOW for FREE Book

NATIONAL POULTRY INSTITUTE, Dept. 413-L
Washington, D. C., All's Harry M. Lamon, Pres.

Dear Mr. Lamon: Send me your FREE Book, "*How to Raise Poultry for Profit.*" I want to know more about my opportunity to make $2,000 to $5,000 a year, spare or full time.

Name .....

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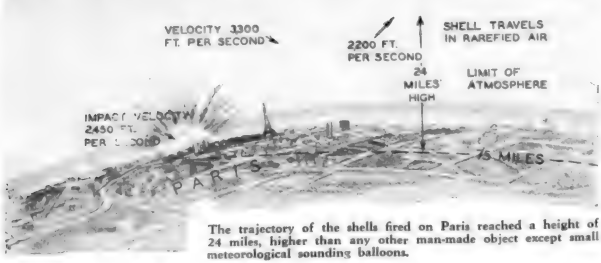
Secrets of the Mystery



The trajectory of the shells fired on Paris reached a height of 24 miles, higher than any other man-made object except small meteorological sounding balloons.

The secrets of the Paris Gun! For the first time in any magazine, Modern Mechanics here reveals the inside facts concerning the most startling and closely-guarded mystery of the World war—the official story of the giant German guns which, in 1918, dropped shells on Paris from a distance of 75 miles, a feat so incredible that artillery experts refused to believe it possible, thinking for a time that the shells were bombs dropped by high-flying aircraft. After the war the guns were destroyed and all information concerning them locked in secret archives. It was declared high treason, punishable by death, for anyone who possessed vital information concerning the guns ever to divulge it. Nevertheless, Col. Miller, author of this article and of the gripping book, "The Paris Gun," obtained military pictures and technical secrets from confidential German sources which has enabled him to reveal to Modern Mechanics' readers the astonishing story of the longest range guns the world has ever known.

ON THE morning of Saturday, March 23, 1918, as all the world knows, a supposed air bomb dropped into a Paris street and, when the fragments had cooled enough to be picked up, it was discovered they were marked with the lands and grooves of rifling, something no air bomb ever possessed.

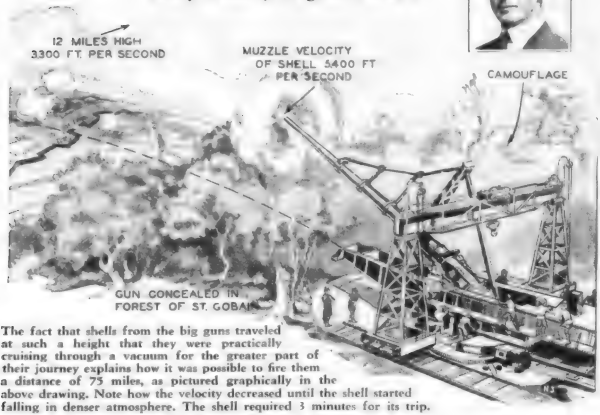
By the time five or six more had crashed down, at intervals averaging about 15 minutes, the French artillery department had definitely decided Germany had accomplished the impossible and was shelling Paris with a gun that must be at least seventy, and probably seventy-five miles away. What that meant may be visualized by recalling that the longest land bombardment in previous history occurred in 1915 when the Germans shelled Dunkirk from a distance of 23½ miles with a 15-inch naval gun mounted on a railway truck.

Twenty-five shells dropped into or near Paris on that March Saturday, killing sixteen and wounding twenty-nine people.

The long range gun, or rather guns, for there were seven of them built, in all, and six were actually used at the front, remained one of the war's greatest mysteries for years after the armistice, guarded by the death penalty for anyone caught revealing

Gun that Shelled PARIS

by COL. HENRY W. MILLER
Chief Artillery Engineer, A.E.F.



The fact that shells from the big guns traveled at such a height that they were practically cruising through a vacuum for the greater part of their journey explains how it was possible to fire them a distance of 75 miles, as pictured graphically in the above drawing. Note how the velocity decreased until the shell started falling in denser atmosphere. The shell required 3 minutes for its trip.

it. No gun was ever found in place, but we did find an almost complete emplacement in France, abandoned when the Germans retreated too fast to destroy it, and we did find an almost complete gun in Belgium, and the measurements of the two coincided. Long after the armistice I learned that our artillery destroyed the railroad junction at Soissons just two hours too late to catch the last of the guns as it was retreating.

But, while the guns remained a mystery, their location did not, for within two or three hours after the first shell fell, artillery experts had figured out where the monsters must be located. An aerial photograph of that district, taken on the previous March 6th, showed two railway spurs which must have been used to place them, and within a short time sound-ranging apparatus at the front had confirmed the diagnosis by identifying the sound as they fired. All that was done before dusk that Saturday, despite elaborate camouflage arrangements that even included trees with six-inch trunks set in slots in the railway line at 30-foot intervals to hide even the tracks to the gun from aerial observers.

Now that the rest of the story can be told, consider the guns themselves:

There was a barrel 120 feet in length, approximately twice as long as the biggest guns built to that time—so long, in fact, that the end had to be supported in the air to keep it from bending down and being shot off by its own shell. In fact, that very thing happened to the first of the guns tested at the German proving ground, for the barrel bent a full inch under its own weight.

Next they fired a shell 75 to 80 miles or more, over a total trajectory ranging from 90 to nearly 100 miles.

The most destructive hit scored in the bombardment of Paris came when the Church of St. Gervais was struck by a shell at a moment when it was crowded with mourners at funeral services for gun victims. The above photo shows the gaping hole in the roof and the tons of fallen masonry which crushed out the lives of 88 victims and injured 68.

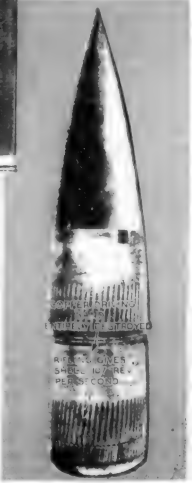
To do that the shell was shot 24 miles above the earth, higher than any man-made thing, save possibly a small sounding balloon, had ever penetrated. At that extreme height the shell traveled through what was almost a vacuum, at a temperature of far more than 100 degrees below zero.

The shell, traveling at an average speed of 30 miles a minute—or sixty times as fast as the usual legal rate for automobiles—took three minutes to complete its aerial flight of 90 miles. It remained away from the earth so long, in fact, that the old world revolved on in space while the projectile was away, so the gunners had to aim a half mile east of the target in order that the target might be there when the shell arrived to hit it.

And, finally, the Paris gun, as I have called it, was the first ever built that contained within itself a device that told where the shell had landed—in fact, the gunners could tell where the shell hit before it had actually hit there.

And to that might be added one other thing—the fact that the speed with which the Allied artillery chiefs located the guns and took steps to silence them defeated their main object, that of stampeding the people and scaring them half to death by the mystery of the thing. For the mystery, as has been said, didn't last through the first morning.

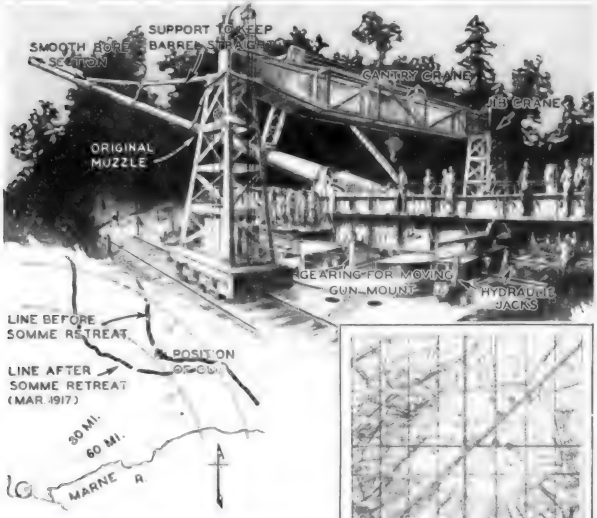
The long range guns, it might be well to explain, should not be called "Big Berthas." The "Big Bertha," named for a fancied resemblance to the matronly figure of Frau Bertha Krupp, was a short, squat, wide barreled seige mortar, a seventeen-inch piece with which the Germans reduced the stone and steel fortifications of Liege in the first weeks of the war.



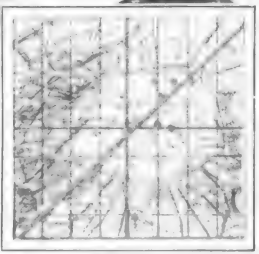
An unsuccessful shell tested for the guns. The nose was hollow.

The long range guns were the conception of Dr. Von Eberhardt, a German physicist, who, early in 1916, with his chief, Dr. Rausenberger, convinced General Ludendorff that a cannon with a sixty-mile range could be built. Work was started, but at the end of the year there came a sud-

Smooth-Bore Section Added to Original Gun to Increase Firing Range



A remarkable and rare drawing of the big German gun in its emplacement is reproduced above, the photo being copyrighted by Col. H. W. Miller. Note the smooth bore section at the end of the barrel. This was added to the original gun after a retreat of the German troops, as shown on the insert map, made it necessary for the gun to fire farther than originally planned.



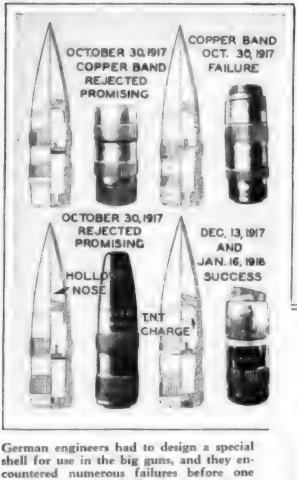
The first seven shell-bursts of the Paris bombardment are shown in red on this map of the city. By plotting the city into squares, the French were able to determine the direction of the enemy gun, as indicated by the heavy diagonal red line, within a couple of hours after the first shell struck.

den wire from the front ordering the range to be increased to seventy-five miles. The German high command had decided to retreat the next spring from the Somme to the Hindenburg line, and a sixty-mile gun would no longer be within range of Paris.

To build the giants the Krupp factory took 15-inch, 45 calibre naval rifles, with railroad mounts, reduced the bore to 8.26 inches and just about doubled the length by shrinking into it the end of a 98-foot long rifled tube. That was the plan for the original 60-mile gun, and it had been built when the order came to increase the range to 75 miles.

No one had ever succeeded in joining two rifled tubes together and keeping them in alignment, and there was no boring mill in Germany big enough to bore a barrel twenty feet longer—the extra length needed to increase the range. For every millimeter added to a gun's length the projectile will go three meters farther, and it figured out that twenty more feet of barrel would turn the trick. So the Germans decided the rifling in the 98-foot tube was sufficient to start the shell revolving and keep it from

Numerous Failures Preceded Development of Successful Shell for Gun



German engineers had to design a special shell for use in the big guns, and they encountered numerous failures before one was finally perfected. The one in the lower right corner above finally passed all tests. The photos show shells which were tested at the German proving grounds. Note excessively small powder chamber, carrying only eighteen pounds of T. N. T.

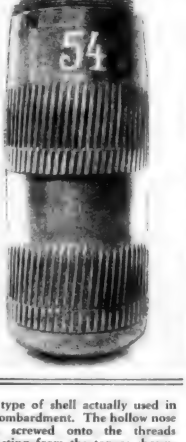
wobbling in the air, and, therefore, the extra twenty feet could be smooth bore tube, and that is how they did the job.

By the summer of 1917 the work was far enough along, it was believed, to order the emplacements built for the first three guns. They were to be placed in what was known as the Laon corner, a salient which enclosed the forest of St. Gobain, and was the nearest approach of the Hindenburg line to Paris.

The guns had been built, but then a hitch developed, for every shell tried was a complete failure. It was not until the following January that a shell was designed which proved satisfactory, and it was this shell that was used on Paris in March.

Ordinary cannon projectiles are smooth steel cylinders fitted with copper "driving bands." As the shell passes through the rifled barrel the soft copper is engraved in grooves by the rifling, imparting the twisting motion which keeps the projectile from wobbling while in flight. The copper bands also act as piston rings to keep the gas from escaping from behind the shell.

But with a pressure twice as great as anything used theretofore the copper bands were sheared off the long range shells. Finally the German engineers created shells with rifling grooved in the steel walls, and copper bands behind the rifles to keep the gases in place. The shells were screwed into the barrel rifles at the breech and when fired, the rifles, with 4-degree pitch, started the projectiles spinning at 107 revolutions a second when they left the rifled portion of the barrel.

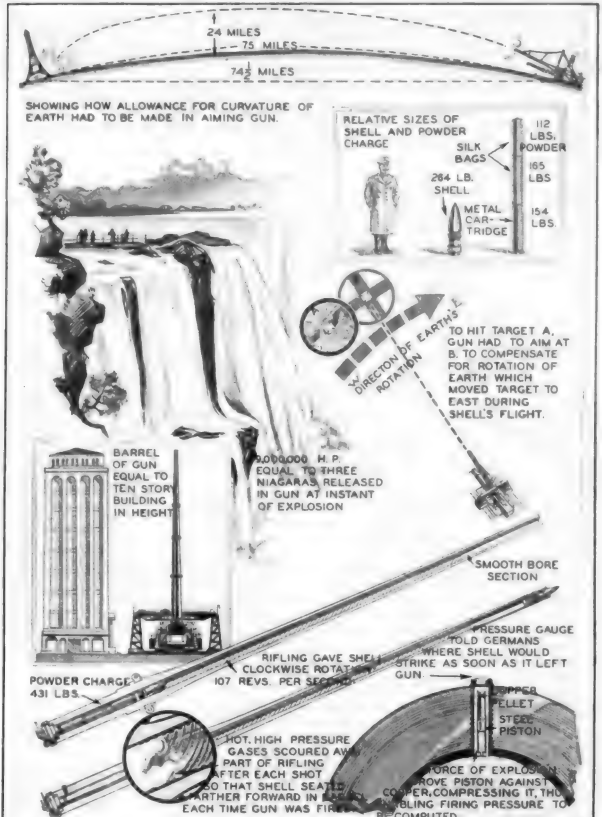


The type of shell actually used in the bombardment. The hollow nose piece screwed onto the threads projecting from the top as shown.

The shell had an enormously thick base and lower side walls to withstand the tremendous pressure of a million pounds. It was fitted with two fuses, to lessen the chance of failure to explode—and in fact not a single one did fail. The load was eighteen pounds of T.N.T. After it was shoved up and twisted into place in the rifled barrel two silk bags and one brass cartridge case of powder were inserted in the breech, a total of 431 pounds of powder for the initial charge in a new gun.

The firing table for the gun was one of the weirdest wonders ever conceived in bal-

Marvelous Features of Huge Guns Show German Inventive Ability



Entirely unique in artillery annals was the pressure gauge used on the big guns, shown in this page drawing of interesting sidelights on the gun's action. A steel piston, driven against a copper pellet of pre-determined length by the explosion, compressed the copper so that when its length was measured the pressure was easily computed.

Most Paris Shells Inflicted Slight Damage

The relatively slight damage inflicted by a shell from the big guns is graphically shown in this photo of a hit in a Paris street. Only 18 pounds of T. N. T. were carried in the shell.

listics. It took into consideration the state of the gun bore, the wind direction, velocity, barometric pressure, and even the compass bearing of the target, to allow for the turning of the world. The gun was fired at only one elevation—55 degrees—and the range was corrected by changing the powder charge. Another addition had to be made to each powder charge to compensate for the wearing of the barrel during the previous shot. The powder chamber of a gun is bored larger than the rifled portion of the barrel, and where the two meet the chamber is tapered down to barrel size in what is called the pressure cone. Each time the gun is fired tiny bits of the cone are eroded, so each following shell slips a little farther up the barrel, and thus shortens the useful barrel length.

How the Gun Wore Out

Cone wear of a fraction of a calibre up to one calibre is usually considered sufficient to warrant sending the gun back to be rebored. (A calibre is the diameter of the shell, thus a 6-inch gun of 50 calibres length has a 25-foot barrel.) But in the German guns cone wear progressed up to six feet of barrel length before they were discarded. This excessive wear explains the fact that shells fired at Paris the first day traveled an average of three miles farther than the ones fired the second day.

The muzzle velocity—practically a mile a second—was the highest ever reached in a big gun. The shell started out at 5500 feet a second; had dropped to 3300 feet by the time it had climbed to twelve miles, and was down to 2200 feet at the height of its trajectory, 24 miles in the air. But more than three-fourths of the total trajectory was up in the rarefied air, where resistance was practically nil, which explains the extreme range attained. When gravity began to pull the shell nose down toward earth the velocity climbed again to 3300 feet, but as it continued to fall it actually lost speed, due to air resistance, and was not traveling more than 2450 feet a second when it hit Paris. The initial energy when the shell left the muzzle, by the way, reached the enormous total of 8 billion foot pounds. (9,000,000 h.p.w.)

I mentioned some paragraphs back that the gun contained a device to tell the gunners where the shell hit, even before it had hit. This was a pair of pressure recorders, set into the breech, to measure the gas pressure at the moment of discharge. German powder varied so much in quality the last year of the war that the muzzle velocity differed as much as 100 yards for various discharges, so the gunners never knew until after the shell was on its way where it was going. But as soon as they had the pressure figure they could tell from their tables where it would arrive.

Despite all these handicaps it is interesting that of the 25 shells fired the first day, 12 landed within a two mile circle. Two, however, were more than eight miles apart, both falling outside of the city walls on opposite sides of Paris.

To take up the shock of the recoil when a million pounds of pressure started pushing a shell up the 120-foot steel tube required an enormous emplacement. In the later installations a pit eight feet deep and forty feet across was dug. On the bottom heavy "I" beams, arranged in a radial pattern, were laid, and on these a doughnut shaped steel caisson was assembled, with manholes in the tops through which it could be packed tight with sand bags. The turn table, key plates and the mount for the railroad gun carriage were built up on

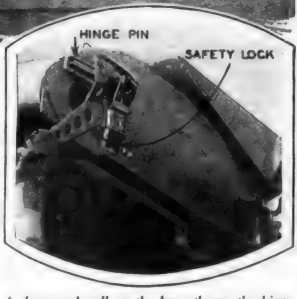
(Continued on page 180)

Fairchilds Have Novel Folding Wing Lock

Hinged wing of a Fairchild with locking device.

THAT limited hangar space is fast driving plane manufacturers to design ships with folding wings is acknowledged by makers and pilots alike. Already limited statistical material indicates that planes with folding wings have reduced hangar charges from 30 to 50 per cent, according to R. H. Depew, Jr., sales engineer for the Fairchild Airplane Manufacturing Company, who recently completed a study of hangar charges throughout the country. This substantiates the Fairchild ideas of folding wing ships.

Of interest in this connection is the locking device used by Fairchild. The wings are hinged to the ship at the rear and locked by the safety catch shown in the illustrations. The lever is pulled down, pulling back the much strengthened hinge pin. The pin fits through the locking unit on the fuselage. When the pin is shot into position a safety lock is clasped, not as an added measure of security for the pilot but to prevent tampering.



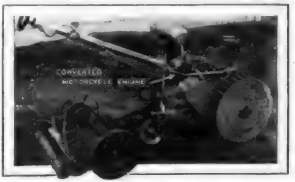
A downward pull on the lever throws the hinge pin into place. A safety lock prevents tampering.

Let Your Bit Measure Hole Depth

BY marking the edge of bits at quarter-inch intervals you can tell depth as you bore. This is a big help especially on work where depth is important.

The marks will not be all in line, but will come every quarter inch, and will not interfere with the boring.

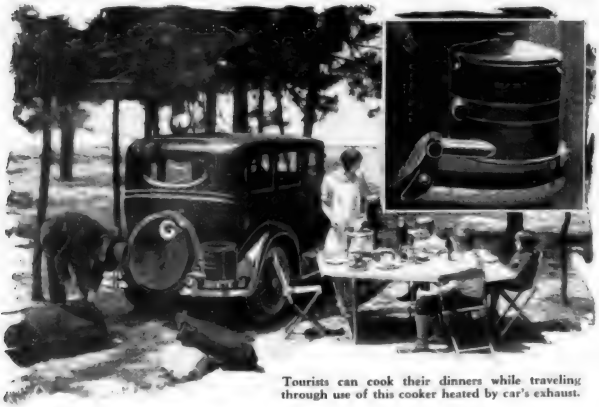
Mower-Tractor Does Odd Jobs



Gardening duties are speeded with this device.

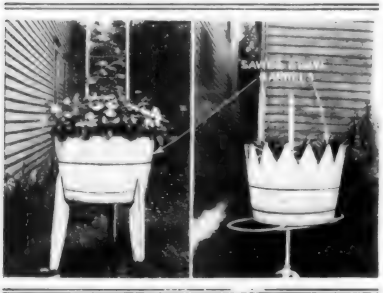
ASCHENECTADY, New York, inventor is responsible for the latest addition to the relief of the backyard gardener. It is a gasoline powered lawn mower and tractor that has a small set of plows, a hose attachment for spraying trees and shrubbery, a harrow and a compartment for small garden tools. The powerplant is a one-lung converted motorcycle engine.

Automatic Food Cooker Runs by Exhaust Heat of Car



Tourists can cook their dinners while traveling through use of this cooker heated by car's exhaust.

MEALS can literally be cooked on the run through the use of the automatic cooker shown in the photo above. The cooker is mounted on the rear bumper of the motor tourist's car and an extension from the exhaust pipe connected up with it, as shown in the insert. The cooker contains a steam pressure kettle which is heated by the hot exhaust gases. An hour's drive is quite sufficient to thoroughly cook meats and vegetables. Total weight of the unit is so slight that running qualities of the car remain quite unaffected. Motor tours are much more pleasant when one is assured of a well-prepared meal at the end of the trip.

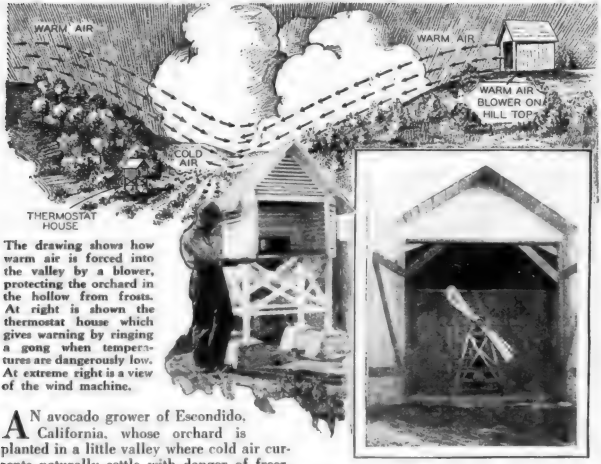


The two attractive flower beds above are made from barrels.

Barrel Flower Beds

BARRELS make excellent portable flower beds when painted up a bit and shaped into attractive form, as shown at the left. One of these flower beds is made from a half barrel supported on three wooden legs cut from two-by-fours held in place with long wood screws. The home craftsman handy with a saw can cut the barrel staves with V-points if a more elaborate set-up is desired. In this case, of course, a barrel with staves of uniform width must be selected. Flowers are more easily taken care of when planted in such elevated beds.

Wind Machine Prevents Freezing With Warm Air Blast

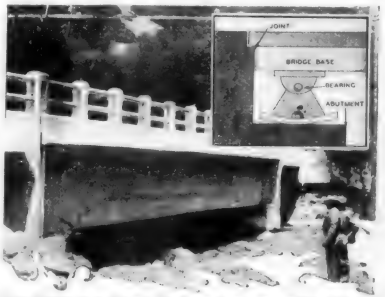


The drawing shows how warm air is forced into the valley by a blower, protecting the orchard in the hollow from frosts. At right is shown the thermostat house which gives warning by ringing a gong when temperatures are dangerously low. At extreme right is a view of the wind machine.

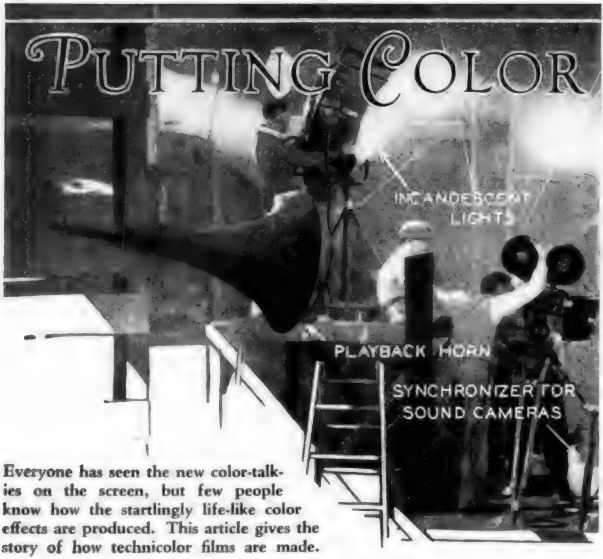
AN avocado grower of Escondido, California, whose orchard is planted in a little valley where cold air currents naturally settle with danger of freezing his fruit crop, hit upon the ingenious idea pictured above of forcing an inrush of warm air from the hilltop down into the hollow by means of an airplane propeller. A thermostat in the valley gives warning by ringing a gong when the temperature drops below the danger level, and an attendant immediately starts up the motor driving the pusher type propeller. Cold air in the hollow is started moving when the warmer currents from higher up the slope are blown down.

A Bridge on Rollers

IN ORDER to allow for expansion and contraction due to changes in temperature, a concrete bridge spanning the Provo river near Provo, Utah, is made in one huge block of concrete resting upon large roller bearings of steel at either end. The insert in the photo at the right gives a clear idea of the unique construction. Abutments of concrete were made first; then the bridge was constructed between them and anchored upon eight heavy steel bearings. Tar filler is used to keep out the frost.



This bridge near Provo, Utah, rests on steel roller bearings.



Everyone has seen the new color-talkies on the screen, but few people know how the startlingly life-like color effects are produced. This article gives the story of how technicolor films are made.

by RAY FRASER

BACK in 1915, Herbert T. Kalmus, a struggling chemistry instructor at the Massachusetts Institute of Technology, invented a camera which took two pictures at the same click.

He had hopes that it would prove helpful to the country constable in trapping the speeding motorist. The picture thus obtained would prove scientifically the speed at which the automobile was traveling and also register the number of the vehicle.

When he tried to find his way to a practical application, he found that one camera of this type would cost more than the sum total of taxes collected by most townships for a single year. But he felt he had an idea and clung to it tenaciously.

He thought of retaining the principle of the multiple-picture camera and concentrating on the injection of color into its product. Prominent Boston business men believed in this prophet of colored pictures and contributed $140,000 to attest to their faith.

Professor Kalmus, who has risen to the chair of physics and chemistry today, with a string of twenty degrees bestowed by the greatest universities on earth, worked sedulously for three years to perfect his first color camera.

Today technicolor has won its spurs in the motion picture industry. Practically all of the talking-picture producers are turning out color movies. It has come forth as a great industry. One of the faithfuls who nursed technicolor in its infant days was William Traverse Jerome, the famous New York district attorney who prosecuted Harry K. Thaw.

The tale of technicolor is as fabulous an episode of business and invention as has

Typical studio scene showing apparatus assembled for recording a talking picture. Note the number of backstage men required for filming a modern movie. In making technicolor talkies the recording apparatus is the same as that used in filming non-color movies, except that a special camera is required, as explained.

ever risen on the modern horizon, bringing millions not only to the engineers who have perfected the color talking-pictures, but also to those who followed its course through dim and uncertain days.

The swiftness with which producers are turning to color is revealed by the annual financial report of the Technicolor Corporation, which has a monopoly of the natural color process used in making this type of picture. The statement issued last February disclosed that the corporation earned a net profit before taxation of $1,173,980 during 1929. The previous year showed a deficit of $46,190. This may be fairly taken as an indication of the growing popularity of color movies.

Eight months ago, "On With the Show," the first all-color talking and singing picture, started the march to color. The officials of Technicolor announce that this year

A technicolor camera set up and ready for action with Ray Rennahan at the crank. The camera differs from most in that it takes two pictures at the same instant.

Because of its sensitiveness to color, movie actors who perform in front of Technicolor cameras have had to adopt a new style of make-up in which they appear exactly as the naked eye sees them—red lips, pink cheeks, no dark spots under the eyes.

dustry stampeding pell-mell into the color-talkies. This is not, of course, intended to be a blatant puff for the Technicolor Corporation, but it is the truth that every great motion picture producer in this country today is using the process with the exception of one.

Technicolor is not entirely a photographic process. In fact, after the negative has been exposed, it almost ceases to be photography at all and becomes something like a lithographic process, except that the colors are not put on by a heavy impression as in the printing of a colored plate on paper, nor as they are laid on in the making of a lithograph.

They are put on the film by what is called the imbibition process. In other words, the emulsion on the film imbibes or drinks in the colors, which are in the form of liquid dyes when applied.

To begin at the start, a technicolor negative differs very little from the ordinary motion picture negative film, except for some necessary chemical treatment added to the usual photographic emulsion. Otherwise, it is the same as the negative used in black and white photography.

It is twice as long, however, because while in photographing a black and white scene more than 100 pictures will be made in color, in whole or in part.

Some idea of the vast success of this industry may be obtained from the fact that in addition to its profits for last year, the Technicolor Corporation was enabled to pay off its notes amounting to $750,000.

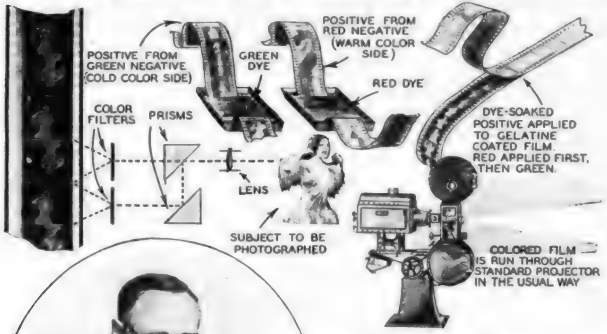
At this point it is appropriate, I think, to introduce to you the president of this Technicolor industry which has struck a rich gold vein. He is none other than Prof. Kalmus, the once obscure inventor.

How is it done?

What brings this added beauty to the screen? How is the absolutely accurate reproduction of a person's complexion, tint of hair, and physical magnetism reproduced in natural hues?

All those are natural questions arising in one's mind as one observes the film in-

Technicolor Camera Takes Two Photos at Once Through Color Filters



Above is a diagrammatic explanation of the method of making technicolor films. Note how prisms in the camera take two pictures at once—one through a red color filter and one through a green. Red here refers to warm colors of the spectrum and green to cold. The negative is then used in making a master matrix for applying dyes to the positive film, as explained in detail in the article.

Photo by Bachrach

Prof. Herbert Kalmus, inventor of Technicolor.

only one frame of negative is exposed at a given instant of time. In technicolor two frames are exposed simultaneously.

The reason for this double length is that behind the lens in the technicolor camera, there is a prism which splits the scene into two images, each identical with the other.

One image—or scene—reaches the negative through a red filter. The other reaches the complementary bit of negative which is being exposed at the same instant through a green filter.

Thus there are on the negative two images, one right side up, the other bottom side up, the top lines being parallel with each other.

Now, to follow the operations necessary to get the positive of this double negative printed on one side of a strip of film so that it may be presented to the eye on a motion picture screen remains to be achieved, and I shall explain this process next.

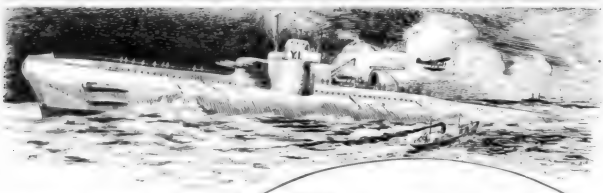
First, a positive film, somewhat hardened by chemical action, is treated with hot water; then a green etching, or relief map of the scene, is recorded upon it. Next, a red relief map is obtained by the same method on another positive film, which, of course, has been exposed to the red part of the negative.

While red and green are used as the terms designating the two parts of the negative, neither an absolute red nor an absolute green color is meant. By "red" is meant the warm colors of the spectrum. By "green" is intended the cold colors of the spectrum.

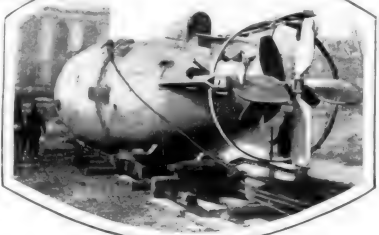
The red side is more in the nature of an orange-red, while the green side is more of a blue-green. Incidentally, it cost the group of inventors exactly $2,000,000 to get this color system in harmonious working order.

(Continued on page 190)

France Builds DIVING Plane Carrier



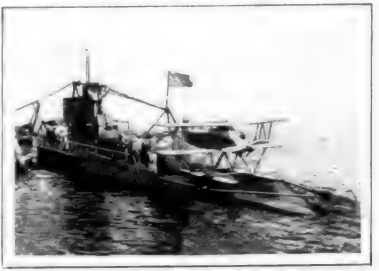
The new French submarine Surcouf, as depicted above and on this month's cover, carries seaplanes in a waterproof compartment on deck.



It's a far cry from the gigantic French sub, displacing 4300 tons, to this original submarine invented by Holland and now on display at Annapolis, Maryland. Note steering fins.

CAPABLE of carrying a fighting seaplane, a full complement of big guns, and a crew of 150 men, the most powerful submarine in the world was recently added to the equipment of the French navy. It is known as the *Surcouf*, and is in reality a light cruiser capable of traveling under water, since when submerged it has a greater displacement than a floating cruiser. The *Surcouf* is by far the most powerful submersible yet conceived, and represents France's latest bid for sea power.

As depicted on this month's cover of MODERN MECHANICS, the submarine carries its seaplane equipment in a water-tight tubular compartment on deck which is tightly closed when submerging. When emerging on the surface one end of the compartment is moved toward the stern of the sub on tracks built for that purpose, a seaplane is lifted to a catapult by a derrick and launched into the air, all within a space of a few moments. At the same time the planes are being launched, the sub's war guns can be bombarding an objective while torpedoes are being launched at a distant battleship, giving the submersible tremendous destructive power.



Uncle Sam's navy was the first to experiment with carrying a scout plane aboard a submarine. The plane is a folding wing ship which fits into the tubular container seen on deck.

Diesel engines drive the *Surcouf* at a speed of 18 knots per hour on the surface; electric motors develop a 10-mile speed submerged.

New Motor Trailer Home Makes Auto Camping Pleasure

Top photo shows motor trailer home equipment stowed on trailer and ready for towing to next camp site.

Photograph above shows trailer set up and ready for use.

THE problem of living quarters for the family while auto-touring seems to be solved by this compact but roomy motor trailer home. Although it contains 32 square feet of space under the roof which has an extended spread of 154 inches, it is so constructed that one person may easily fold it in a few minutes.

Sleeping accommodations are adequate for four persons, and plenty of room is available for a gas stove and food storage. The bedding is carried in a flat position and luggage is carried in a convenient position at the rear of the trailer. This trailer should do away with the tedious task of pitching and striking a tent.

Ignition Terminal Won't Come Off

A NEW type of locking ignition terminal for airplane engines, which cannot be dislodged by rough landing, stunting, engine vibration or propeller blast, has been recently introduced by a Connecticut manufacturer. It has been approved by the Army Air Corps at Wright Field and has been adopted by several engine manufacturers.

Cigarette Holder Holds Ashes

AUTOMOBILE drivers, sailors, steel structural workers, and others who like to smoke cigarettes but are sometimes handicapped by the wind, will be delighted to learn of the new cigarette holder which completely covers the cigarette.

The screen permits air passage and holds ashes.

The device prevents the uneven burning caused by the wind and stops flying sparks as well as prevents the falling of ashes. The latter feature will save wear and tear on the human arm by dispensing with the necessity for always reaching for an ash tray.

The holder is made of bakelite and the mouth piece screws into the screen unit.

TRICKS of the

by ALFRED ALBELLI

Have you ever watched a huge factory chimney being leveled to earth with a charge of dynamite? If you have, you will have wondered how the wrecking crew was able to make sure in advance that the shattered chimney would fall to the ground in a spot where it would miss adjacent buildings. The trade of house-wrecking has its full complement of tricks which are explained in this fascinating article by Mr. Albelli.

An old water tower near New Rochelle, New York, dynamited to make room for a new structure. Wreckers must know just where to place the dynamite and how powerful a charge to use in order that structures like this will fall in a pre-determined direction.

MIGHTY edifices, more stubborn in their resistance than the walls of Rome which were stormed by the hordes of Attila the Hun, crumble every day in New York City before the crowbar onslaught of the house-wrecker. It has been estimated that during 1929 the devastation wrought by the army of 2,000 building annihilators in Greater New York amounted to $200,000,000.

The most picturesque man in the building-crushing business in America today is Alexander Zinovick, president of New York's Local 95, House-Wreckers' Union. He has been in this field for nearly fifteen years, which represents a ripe old age so far as the dare-devil stunts of this unsung army go. The wrecking profession thrives in all parts of the country, but its center is in Manhattan where big structures are torn down to make room for still greater skyscrapers.

Zinovick figures out all his maneuvers with the caution and foresight of a generalissimo. Let us take the last three tall buildings in the center of New York and note how this man proceeded to reduce them into scrap-heaps.

He gave the once-over to the Knickerbocker and Casino theatres on Broadway. In the Knickerbocker theatre joh he saw that not only would the show-house have to be destroyed, but also a seven and a twelve-story building which were adjacent to it. He looked over the entire layout and said to the contractors, "We'll have that site cleared in forty days."

Next he inspected the Casino theatre. It looked like a pretty tough nut to crack. All theatres are the bane and woe of the wreckers, for that matter, because they have a hollow interior and the dangers to the men are manifold. Zinovick said his boys would have it out of the way in twenty days. Two blocks away, at the corner of Broadway and West 41st St., the Continental Hotel, part of the Great White Way's gay history, was marked for the wrecker's hands next.

House-Wreckers

House-wrecking—which includes the leveling of skyscrapers, factories, and other outdated obstacles to progress—is usually not thought of as an important industry, yet last year the volume of business done by wreckers in New York City alone totaled $200,000,000. Nerve, presence of mind, and quick wits are essential equipment of the wrecker.

Wrecking the Fifth Avenue mansion of Senator Clark of Montana. Its ornateness won the home the title of "Clark's Folly." Note how powerful cranes are employed to aid the wreckers.

In addition to these central spots which would be minus buildings, it meant that two other principal locales in New York were without structures simultaneously. One is the scene of the former Waldorf-Astoria Hotel which was levelled to make room for former Gov. Al. Smith's Empire State building, to be 85 stories and the tallest in the world. The other, the northwest corner of Fifth Avenue and 42nd St., was razed to make way for a 58-story tower for Walter J. Salmon.

Incidentally, Zinovick points out that the biggest job ever undertaken by his legionnaires was that Waldorf-Astoria wrecking. He kept 470 of his crack crowbar wielders busy on that enterprise for 100 working days. He also had to call in outsiders, crews of ironworkers and laborers.

"One of the strangest jobs we ever had," explained Zinovick, "was the Pictorial Review building at 7th avenue and West 39th street. It was a 19-story building. It hadn't been up ten years when I was called upon to rip it down. And down it came, all nineteen floors, to make room for a building suitable for the garment trade.

Even the historic Waldorf Astoria has given way to the advance of modernity. It is on this site that former Governor Al. Smith is erecting his gigantic office building. This hotel, perhaps above all others, will long stand out as New York's greatest.

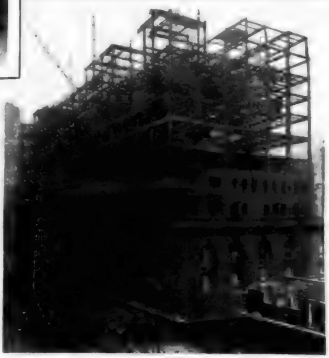
"But we don't mind the size. For instance, we wouldn't mind at all going to work on the Chrysler building which is now the tallest building in the world. That's safer to tear apart and permits of some kind of system. We could have that down in nine months. The Woolworth building would take my army eight months to reduce to dust.

"We have our tricks, of course. I would call them tricks of the strangest trade on earth. We have to be prepared for any sort of job, from wrecking a church to a shed. Then again, we have to be resigned to any fate. House-wrecking is every man's job. Great skill and experience are qualifications, but nerve and presence of mind are invaluable assets. The life of a building-wrecker has been averaged at twenty years. Two decades of the business and if you're still alive you'll be surprised. You will also surprise your house-wrecking brethren. They expect to go at any time.

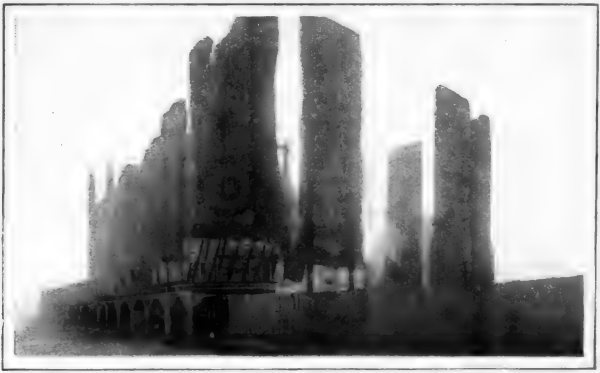
"You get a glimpse of a tall wall and the first thing that comes to your mind is one lusty blast of dynamite and the whole works crumbles down to rubbish to be carted away. But you cannot use dynamite in a large city, for other adjoining structures would be placed in jeopardy. You might wipe out a whole section with one explosion.

"Before I let my boys tackle a job I give that plant a thorough looking-over. I have to bear in mind the security of the adjacent buildings. Shoring often has to be installed, to support the walls of those other buildings when the one in course of demolition weakens the walls of those standing. And if the building to be brought down was destroyed by fire, flood, or explosion, the walls of this particular building have to be propped before the wrecking operations can start.

"We use the standard system, employed throughout the country, in wrecking build-



Another step in the demolition of the Waldorf Astoria. For several months prior to its closing, sales of furniture and fittings were conducted. The figures ran into millions as priceless antiques and ordinary crockery went under the hammer to those who cherished some particular mementoes of this hostelry.



The skeleton remains of what was once another landmark in New York's skyline. As can be noted, the wreckers work from the inside out. The walls are usually left standing until the interior has been cleaned. It saves much time, for the walls can be tipped over and the bricks salvaged without need of picking them apart individually. Vast sums are thus saved for much material can be re-used.

ings. This consists of breaking through the roof first and then tearing down the structure story by story. So-called 'bar-men' take their posts on the walls and soften the walls by smacking them with heavy hammers. Then they pry away with crowbars and the debris falls to the floor below where it is carted away in wheelbarrows by 'greeners,' laborers, who allow the material to go down a chute leading to the sidewalk.

"In order to prevent the dropping material from picking up too much momentum, the chutes descend in a broken line. A stop-gate at the end of each chute controls the speed of the flow.

"Seldom are the walls broken down en masse. They are picked slowly apart, thus lessening the dangers, and increasing the salvage of material. Horse scaffolds, or stagings, are erected alongside of walls which are too thin or weak to hold men on them.

"After a few stories have been torn down, the iron workers go up to the top of the steel skeleton and burn the steel beams apart with oxy-acetylene torches. Derricks are brought into play. These beams are first secured by a sling attached to a derrick, so that they cannot drop or swing when they have been cut away from the other steelwork to which they were attached. Most of the steel thus salvaged is resold.

"While the iron worker is busy with his torch, the house-wrecker, armed with his hammer or crowbar or ropes, steadily razes the building to the ground. He has got a broom-swept job to do, that is, clear away the old building to the last brick.

"I recall that the steel forming the main arena of the old Madison Square Garden has been stored away. It might be used some day to erect another similar structure in another city. To my mind, I doubt it has any economic value in the face of changing styles in building.

"In reality there is little saving in my game. When we are called in to rip things up and down we don't tackle the job with kid gloves. It's a case of bare knuckles. Two years ago we had Judge Elbert H. Gary's Fifth Avenue mansion to tackle. There was a famous marble spiral staircase in the home which the Steel King had paid $150,000 to install. This staircase was offered at auction, but there was no one to bid a single dollar. We junked it.

Yesterday the site of Temple Eman-u-El, the house of worship that shares with St. Patrick's Cathedral and St. Thomas the distinction of serving the Fifth Avenue section—today the home of a bank whose resources run to many millions. Again can be seen the methods used in razing giant structures.

"The same thing was true of the Fifth Avenue palace of Senator William A. Clark, which became known as Clark's Folly because of the extravagance put into it. It was all we could do to scrap the valuable staircase there. The pieces were dumped into the ocean.

"In one bank building we had to get rid of a huge vault which was burglar-proof and bomb-proof—and I venture to say they intended it to be house-wrecker-proof. It was earthquake-proof also. We had to use compressed jacks and hydraulic jacks to smash it down. Old Delmonico's Restaurant was particularly difficult to demolish because of the singular bridge construction on the interior. This was forced down with huge pine timbers, made into battering-rams.

"Another stumper we had was the old Chemical National Bank. Here there was an arch of solid stone. It required four days to take three keystones out of the center of the arch. The old Seaman's Bank at 76 Wall street was a difficult job because it had a cast-iron front and many vaults and safes. This was only a few feet from the elevated line trains. Great care had to be used so that parts of the building did not fall onto the trains.

"In clearing the way for the new Waldorf-Astoria Hotel at 49th street and Park avenue we had to get rid of the Y.M.C.A. and the Adams Express buildings. These were hazardous jobs because the New York Central railroad lines ran at the bases of these buildings, through tunnels.

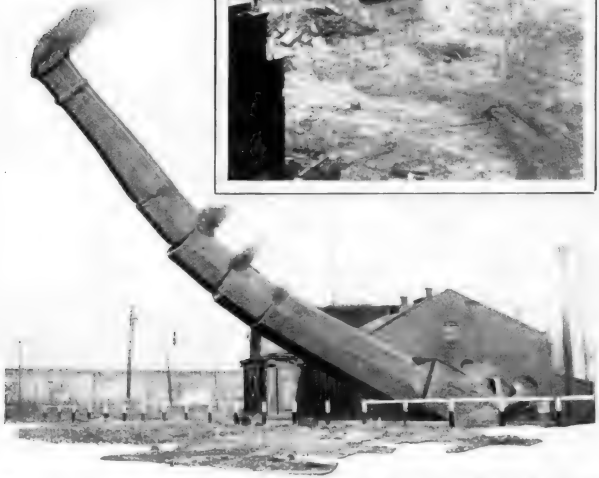
"A short time ago we were working away at an 11-story building in Brooklyn. My men were pulling down a clock-tower by means of ropes, expecting the structure to ease off its base slowly and then we could chip it apart. But instead the ropes which were supposed to hold it snapped and it crashed through the roof and didn't stop in its downward fall until it reposed in the cellar. Luckily, every man escaped injury.

"Out of my army of 2,000 men, twenty of them met their death last year in the course of their work. The year before twelve were killed. Considering the close calls to which they are exposed every hour of the day, it is astounding that the fatalities are not greater.

"There are two systems of demolishing buildings. One way is to clear out all of the floors first, leaving an empty shell, and then tear down the walls. The other is to mow down the walls and then work away at the floors at the same time. The latter is preferred by the workman because it is safer. Contractors like to get rid of the floors first. That system is swifter though more dangerous.

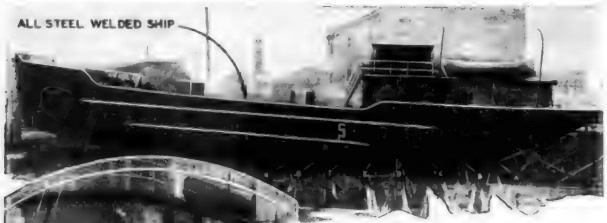
Salvaged Materials Find Many Uses in Other Structures, Says Expert

"Any day anyone wants to get an eyeful of thrills let them pause to watch the house-wreckers in their lofty perches. Sword-swallowers and lion-tamers have a snap compared to us. When we leave our homes in the morning, there is no telling if we'll return. We don't worry about it. Yet it's our chosen trade. The pay is good."

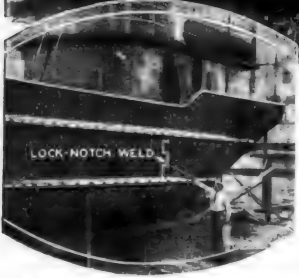


The upper picture reveals a 400-ton tower that tried to resist the wreckers. For days it succeeded in stumping engineers, but it soon came down to make way for the Boston Post Office. The chimney kept aviators at Port Newark, N. J., from making clean landings—until it, too, came down.

First All-Welded Rivetless Ship Launched



This oil tanker has started the ship building industry on a study of the all welded rivetless craft.



R. F. Smith, who designed and supervised construction of all-welded ship, points out weld type.

According to naval experts the lock-notch system of electrical welding used in the construction of the vessel will revolutionize the shipbuilding industry.

This type of ship saves 20 per cent in weight and 25 per cent in building cost as compared to riveted ships, besides offering greater cargo space. Eight thousand pounds of electric welding wire were required as compared to 85,000 pounds of rivets necessary to build a riveted ship of the same size.

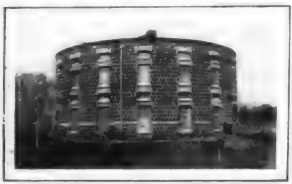
Richard F. Smith, ship designer, expert electric welder, and inventor of the lock-notch system of welding, designed the craft and supervised its construction.

One feature of the Smith system of welding is that it leaves no distortion or buckling in any part of the structure and his deep weld system permits flexibility.

THE first all-welded, rivetless ship in the history of marine engineering, has been launched from a South Carolina shipyard. The ship, an oil tanker of 2,500 barrel capacity is 120 feet in length, 23 feet wide and has a draft of ten feet.

Non-Profitable Brooder Converted Into Successful Mushroom Nursery

WHEN a California rancher found that his huge, scientific baby chick brooder was not paying dividends he set about finding another use for it. He decided to grow mushrooms. The two-story, circular, tile tower has 7600 square feet of ventilated and heat controlled space. The nursery is heated to a preliminary temperature of 135 degrees and then cooled to 90 degrees before the new spawn is placed in the beds. Spawn is a yeast-like substance containing mushroom seeds and is obtained in quart jars.

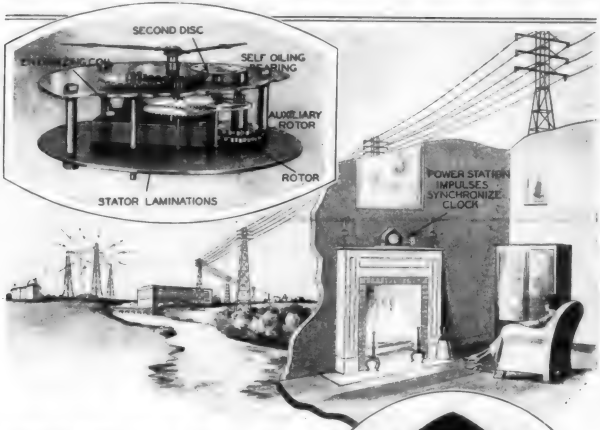


Californian's gas heated, tile mushroom farm.

Mushrooms find a ready market and high prices in most communities, the majority of people preferring to purchase them at stores to risk picking the deadly toadstools.

The plant is heated by gas and care must be exercised to maintain proper temperature.

How Power Impulses Keep Electric Clocks Accurate

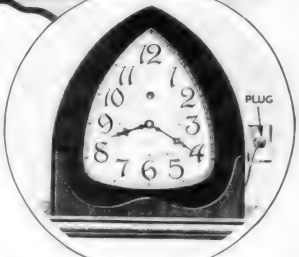


Alternating current only will operate electric clocks. With most power stations standardized on 60 cycles a second, A. C. impulses actuate a cycle motor that is calibrated to record time.

WHY does an electric clock keep perfect time? Some of the so-called electric timekeepers are nothing but standard spring-driven clocks, equipped with an electric motor and a device to turn on the current at regular intervals and wind the spring. But others have no spring, no clock works, in the usual sense, and do not, as a matter of fact, either measure or keep time, yet they are always accurate.

Hidden away in the latter type is a little synchronous or cycle motor which is really acting as a meter, to measure something happening at the power station, and, because that thing happens at regular intervals, the meter can be calibrated to record time.

The actuating impulse is the alternating of the current produced by the dynamos at the power house, which is why electric clocks can only be used on A. C. lines, and will not work in D. C. power districts. Most companies have standardized on A. C. of 60 cycles a second, and it is for this current

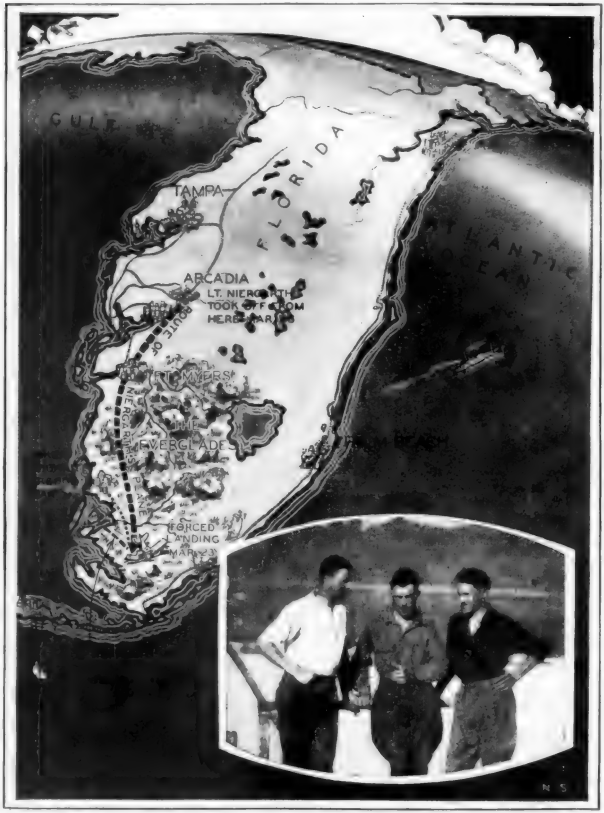


The motor armature turns one pole for each alteration in the current supplied for the light socket. The current rarely varies from 60 impulses a second. Any change is made up automatically.

that the standard clocks are built.

Dynamos vary but the variation is averaged up at the power house, so that if the dynamo gains two or three cycles in one hour it will close them the next. As it takes a change of 60 full cycles to throw the clock off one second, it can always be brought back to accuracy by this averaging process.

CRACKED-UP *in the*



Map of the scene of Niergarth's crash. Insert shows Lieut. Niergarth, at left, with two members of the rescue party.

Everglades

by MAJOR H. H. ARNOLD

Here is Lieut. Omar Niergarth's cracked-up Jenny as the rescue party found it in the Everglades. Note the mud, water, and rank grass which caused the ship to nose over.

The thrilling true story of an army airman whose plane was forced down in the all but impenetrable Everglades. For eight days he battled through the swampland, beset by insects, alligators, and poisonous snakes—all of which proves that the glamor of adventure still clings to the business of being an aviator.

WHEN Lieut. Omar Niergarth of the Army Air Corps took off in a Jenny from the air field near Arcadia, Florida, on March 23, 1920, he had no warning of the hardships and dangers ahead of him. There was nothing unusual about a young lieutenant shoving off after breakfast for Ft. Myers some 50 miles away. The unusual did happen, however, when the JN, helped by a tail wind, reached Ft. Myers in 25 minutes. A Jenny just could not travel that fast and Niergarth was sure that he had been drifting with a cross wind and had reached Punta Gorda, the half way point. He corrected his course and carried on.

Nothing unusual happened for the next twenty minutes or so and he felt quite secure in spite of the fact that he ran through a rain storm and was flying over stretches of almost impenetrable swamp. He awoke with a start when his engine started to spit and cough. Realizing that his main tank was dry, he tried to turn on his reserve supply but could not reach the valve. There was nothing to do but land and, provided he did not damage his plane, turn on the reserve fuel for another take-off.

There were few open places in sight, but he picked out a promising looking spot and headed for it. As he came close his chances for making a safe landing looked even better. The area selected was covered with short grass and seemed to be a level, dry stretch. Niergarth considered himself to be very fortunate, as it was the only open space that he had seen for miles. As far as the eye could see there was nothing but stretches of water, large mangrove trees and tall saw grass.

He came in for a slow three-point landing. The plane settled, rolled along the ground for a while and then slowly turned over on its back. Niergarth struggled out from under the cockpit, felt himself for injuries and found none. He climbed atop his wrecked plane and looked around. There was nothing in sight but the endless, desolate Everglades as far as the eye could reach.

Niergarth was now faced with a serious problem. Should he stick with his plane or should he start hiking? If he stayed with the plane, rescue parties might not reach him for weeks. The water around was probably brackish and he had no food. The

Flyer as He Emerged From Swamp

Lieut. Niergarth as he looked after his long trek to civilization. His trousers were torn off by thorny swamp creepers and he was protected only by his thick government issue underwear.

Seminole Indians in the swamp might or might not be friendly. On the other hand, if he started hiking, he might never reach civilization. The swamp was considered to be impassable by the natives. There was the danger of being struck by the deadly water moccasin or being caught by one of those terrifying denizens of the swamp, the alligator. It was a serious moment. If he decided correctly there was a chance of getting through alive, but if he made a mistake, who would ever know what had happened to him?

Omar secured the blue print map of southern Florida from the cockpit with a view of determining the distance to the nearest town. About that time it started raining and before he realized it, his blue print map was no more. The water had turned it all white. The help that he expected to get from the map was gone. It was now up to him. He had four courses open—stay with the plane, try to reach one of the scattered Indian camps in the swamp, hike out for the East Coast or start wading for the Gulf Coast.

In spite of the falling rain, he was thirsty and tried to drink water from one of the pools nearby. It was too salty. He looked at his radiator and found it had been split. Obviously he would have to hunt for drinking water. The Indian camps might be anywhere in the swamp, but his chances of hitting one were very slim. The Atlantic Coast was 70 or 80 miles away, while the Gulf Coast could not be more than 15 or 20. However, there were few settlements on the Gulf Coast while there were many on the Atlantic Coast.

After losing his map, he crawled under one of the wings to think things out. He reached for a cigarette and found that they were all wet and spoiled. He tried his matches. They were also wet. With the wet matches went all chances of lighting a signal fire to attract rescue parties. He knew that when he did not reach Ft. Myers search would be started by air and probably by land. With no water, no matches, and no food Niergarth decided to start hiking for the Gulf Coast. Even if the planes did locate his wrecked ship it was decidedly doubtful if they could land without cracking up.

Thus it was that he started his long, arduous hike through the Everglades. For six days he fought his way through the muck and mud of the swamp. At times it was up to his shoulders. The saw grass tore his face and hands. The spear grass ripped his clothing. The mangrove roots were slippery and he stumbled and slipped in the water and muck. The insects bit him until his face swelled like a balloon.

In order to get some rest at night, he covered his face and hands with a thick coating of mud so that the insects could not bite. This protected against the actual stings, but the constant humming kept him awake in spite of his physical exhaustion. He could not sleep in the water so had to sleep on logs. He would awaken as he fell off into the water with a splash.

Drinking water was quite a problem, for it was seldom that he found water which did not have some salt in it. However, there were fresh water streams here and there which he found. Food was a much more serious problem. He tried to eat the tender buds and roots of plants and trees, but got little nourishment from them. He found

Photo Shows Typical Everglades Swampland Traversed by Niergarth

Typical of the swamp country through which Lieut. Niergarth fought his way is the above photo. Alligators, poisonous water moccasins, and myriad stinging insects inhabit the muddy morass of the Everglades. Insert photo shows a trick popular with Florida stunt men—wrestling with alligators.

a species of small snails and ate them, but they were not very palatable. He remembered that the natives always spoke of the cabbage palm. He saw many, but the edible part was always high up in a slender tree out of his reach. When he was fortunate enough to get his hands on the cluster of branches and leaves, he found that it was impossible to get at the tender part without an axe. There were plenty of fish in the water. In fact, there were hundreds in sight whenever he crossed a stream, but he had no means of catching any.

He had no compass and had to direct his course by the sun during the day and the moon and stars at night. One night when he stopped his endless trek through the swamp, he placed a log so that it headed toward the north-west, his direction of march. He then laid down on the log and slept. He awoke after a couple of hours and getting his bearings from the log, started hiking. After several hours the sun came up directly ahead of him. By some irony of fate the log had turned during the night.

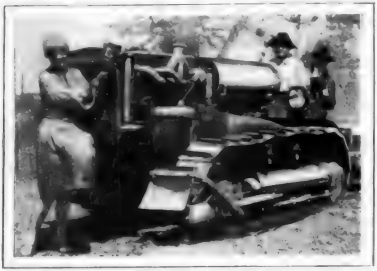
Then it was that the thought of giving up came into his head. What was the use of this losing fight? So far he had escaped snakes and alligators, but how much longer could he miss them? He was sitting on a mangrove root. He raised his eyes and saw the skeleton of a large alligator in a hole a short distance away. The alligator had an old shoe in its teeth. Was that an omen? Omar decided that he would travel as long as he could put one foot before another.

Finally he came to the gulf shore. He hiked northward and came to the Caloosahatchee River. He saw a hut on an island a short distance out in the gulf. He could hardly believe his eyes, for there were men working around the hut. Omar gave a shout and a few minutes later he was being taken to the hut in a row boat. He was a sorry sight. His breeches were gone, torn right off him. His shirt was in shreds and his skin a mass of sores and cuts.

Niergarth had reached a habitation, but

(Continued on page 202)

World's Non-Stop Tractor Record Made by Californians



The Battaglia brothers of San Jose, Cal., about to set out on their tractor record as Miss Frances Fennel christens the steed.

A STANDARD by which modern tractor farming may be gauged was set up by the Battaglia brothers and their caterpillar tractor near San Jose, California, when Dean C. L. Cory of the College of Mechanics, University of California, unsealed the gas tanks and stopped the official non-stop record of exactly ten days and nights.

The Battaglia brothers were merely doing their spring work, running night and day as thousands of other farmers at "peak" seasons, except that engineers were checking the work. The boys worked 12 hour shifts without stopping the tractor engine for 240 hours. The work that they performed during the 240 hours was disking and dragging orchards. The attempt was made to establish the durability of tractors.

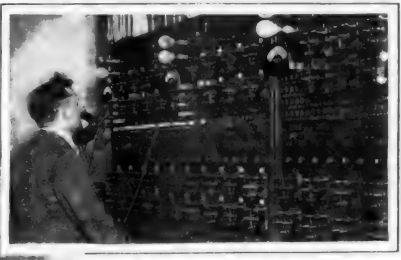
Youthful Miami Inventor Blazes Another Trail in the Safety of Flying

ONE of the difficulties of air travel is the impossibility of making repairs outside of the cockpit while the ship is in flight. This holds particularly true when the trouble is centered about the tail. James Terry, inventor, of Miami, Fla., is shown demonstrating his safety device which makes it possible to make repairs without landing.

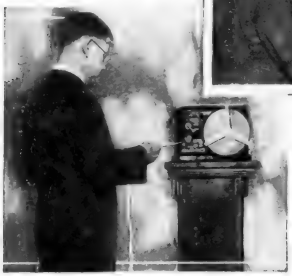
With the aid of this safety device, experienced mechanics can make repairs on planes in flight. Ordinarily landings are necessary in the event of trouble with tail surfaces but are now eliminated.

High Speed Stock Tickers to Ease Record Market Days

THE Western Union is spending $4,500,000 in an effort to speed up stock quotation service. The task is the largest in quotation service history and is the culmination of three years of labor, six months' training of personnel in schools of five cities, the construction of 5,000 city to city wiring and circuit channels in 350 cities and towns in the North American continent. High speed tickers have been ordered at a cost of $2,500,000 to be rented to brokers in the United States.



The circuit control board in the new high speed stock ticker sending-room of the Western Union in New York. This is the type of board installed in cities throughout the country — to control tickers in each of the cities. This one is the circuit control board for all the tickers in downtown New York, supplying thousands of offices.



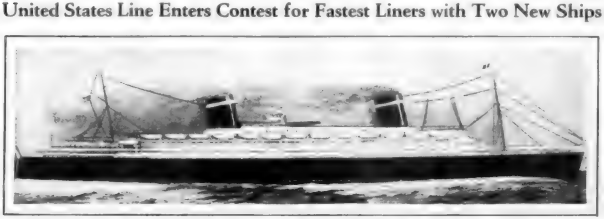
The 1930 model stock ticker—the new high speed device of which the Western Union has ordered 10,000, and has begun installation in brokers' offices and security dealers throughout the country.

Firecrackers Without the Powder

LAST summer in one of the more remote sections a group of four boys were celebrating the Fourth in a most peculiar fashion. They lacked the usual fireworks and noise-producing paraphernalia, yet they were producing explosions.

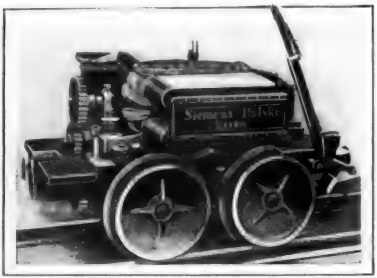
A few drops of water were placed on the flat surface of a stump. Next, a live coal raked from an open fire was dropped on this moist surface. One of the boys stood ready, and before the moisture had time to kill the heat of the coal, he would give it a quick, square blow with a sledge.

United States Line Enters Contest for Fastest Liners with Two New Ships



A drawing of one of the two huge ships which will be built by the United States Lines—designed as the biggest and fastest liners in the world. They will have a gross tonnage of over 50,000, and will be 962 feet long. The speed of the ships will average twenty-eight and one-half knots an hour.

Timely TIPS for the



The first successful electric locomotive dates from 1879

The problem of what to invent is one of the first to confront the young inventor, but no less important is the problem of what not to invent. In this, the concluding article of a series on inventors and inventions, Mr. Miller points out how useless effort may be saved by sidestepping unprofitable fields of invention.

A NEWS clipping under a Toronto date line, says:

"An art lost 2,700 years ago, the quest for which has since baffled the scientists of the world, is claimed to have been discovered by two London, Ont., men who display samples of copper keenly hardened and ground."

Outside of a couple of errors the sentence is correct. The first error is that the art of hardening copper has never been lost, and the second is that scientists have never been baffled hunting for it.

The same story, with some variations, may be found in any newspaper any year. Last year it was a young man near Boston who had rediscovered the supposedly lost art of the Egyptians and exhibited a copper razor in proof of his claim. The year before it was a St. Louis mechanic who had perfected the process and was preparing to sell it for one or two millions either to a Detroit automobile magnate, or a Pittsburgh steel maker.

Of all the things in the list of what not to invent, hardened copper should come first. How the story started that the art of the Egyptians had been lost is a mystery. Hard copper went out of business simply because better materials were found, first iron and then steel. The New England chap with his copper razor probably had a lot of fun, but, as everyone knows, copper oxidizes when exposed to the air, and an ordinary cheap steel razor is better than the hardest copper one ever made.

The copper razor maker, however, probably learned enough about metals and chemistry to go on and do something really worth while, if he isn't discouraged by his first failure. But if you want a hard copper formula consult any good work on metallurgy, or any good reference work, and take your pick.

This game of inventing has produced all kinds of quirks, from the inventor who was honestly deceived, to the one who dishonestly deceives. The sharpers range from a few unscrupulous patent attorneys who prey on the luckless inventor, to the pseudo inventor who makes a living preying on the gullible public. Most frauds involving inventions are worked through a stock-selling scheme, but occasionally a much more ele-

This card holder is making money for its inventor.

INVENTOR

Concluding a Series of Articles
by JAY EARLE MILLER

An early product of the Baldwin Locomotive Works. Note the circus-wagon bas-relief above the rear wheel. The present huge Baldwin company traces the beginnings of its success back to this design.

mentary swindle is perpetrated even before the patenting stage is reached

One of the simplest was invented by a westerner who followed the patent office gazette religiously, and, when he saw a likely looking device, prepared drawings for a somewhat similar invention, changing the original just enough so that the sketches could not be recognized as a bare-faced steal. Then he would call on likely backers and sell them fractional interests for a few dollars "to raise money to get the idea patented and ready to be sold to a manufacturer."

In that way he might raise several hundred dollars in lots ranging from $25 to $100 from each buyer. Out of the proceeds $10 would be sent to Washington with instructions to search the records and see whether the inventor's "idea" conflicted with any previous patents. Back would come word that another inventor had anticipated the idea by a few weeks or months, and the sharper would "regretfully" pass the information along to the investors, and pocket the rest of the money.

Another pair, also on the Pacific coast, worked a much more elaborate scheme. One would pose as a wealthy and retired business man, meet the moneyed men of a town, be a good spender and a good talker, and then casually work a conversation around to the subject of invention, giving him an opportunity to remark that there was a good field for such and such a thing and he wouldn't be surprised to see some clever fellow perfect it some day and make a vast fortune.

After that the ground was allowed to rest for several weeks, then the other half of the pair would appear and seek to enlist the aid of the same men in financing his invention. The chosen victims would recall the remark of the supposedly wealthy and retired business man that such a device would earn a fortune, and jump at the chance to invest. Needless to say, the invention either would not work, or had been anticipated by some one else.

If anyone tries to sell you an unpatented invention or an interest in one you can quickly determine whether the idea is new and novel by spending $10 on a search of the patent records.

Of all the things not to invent, probably more people spend more time on perpetual motion, than on any one subject. Despite

Book Holder Is Simple Invention

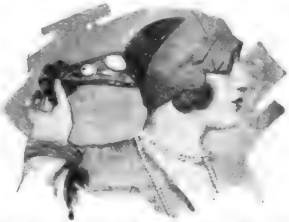
This newly invented book rest enables one to read comfortably without the necessity of using both hands to hold the book.

the fact that science knows perpetual motion to be an impossible dream, and the U. S. patent office no longer will issue patents on such devices—through invoking the rule requiring a working model to be submitted in cases of doubt—yet hundreds, and perhaps thousands of people are constantly trying to accomplish the impossible.

All perpetual motion schemes fall into three general classifications. There is the magnetic machine, the hydraulic type, and the centrifugal. The commonest example of the first is an inclined plane, with a steel ball and a magnet at the top to draw the ball up. Just below the magnet a slot in the track is supposed to allow the ball to drop to a lower plane, and return to the starting point, when the process would be repeated. As far back as 1579 inventors were flirting with the idea, and Bishop Wilkins in his "Mathematical Magick" describes it at length, with a picture of the device as it would appear in operation. Even the good Bishop knew it wouldn't work, and later in his book admits the fact that no magnet powerful enough to pull the ball to the top would release it to let it fall through the slot.

The hydraulic type is usually some arrangement of tubes or tanks in which the weight of a liquid in a tank of large diameter, escaping through a small outlet in the bottom, is supposed to force liquid up through a tube of small diameter, and thus perpetually renew the supply. The fact that liquid seeks its own level should convince any one that the scheme will not work, yet the idea is born again in some fertile brain at least once a week.

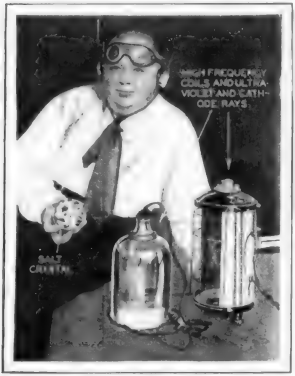
The centrifugal type is usually some variation of a wheel with pivoted arms, weighted at the outer end, the theory being that the extended arms on the descending side will, because of the greater distance from the center, lift the arms on the opposing side, which are so pivoted that they hang closer to the hub. As most everyone knows the farther a weight is from the point of leverage the greater the force exerted, and on paper most of the wheel schemes look feasible. Unfortunately a drawing doesn't show that when the initial impulse is absorbed the wheel will find a point where the two forces are exactly balanced and come to rest. Sir Walter Raleigh is one of the



Latch key, powder puff, and needle and thread for mending are contained in this novel "door hat" recently put on the market.

most famous builders of such a wheel. Selling stock in a perpetual motion machine, or an interest in the invention, would not appear to be a profitable field of finance, yet the court records are full of just such cases. In more than one instance a company has successfully financed the impossible, and sometimes exhibited a machine that actually appeared to work, but always there was fraud concealed somewhere about it. The fraud was well concealed, but it was just as much there as it is in those machines, much frowned on by Uncle Sam, which are supposed to convert plain paper into dollar bills. And, curiously enough, I never heard of but one case where the "money making" machine was supposed to turn out anything larger than dollar bills, though it must be apparent that if it could do that it would be just as easy to make fives, tens, twenties, or anything larger.

Sir Isaac Newton of falling apple fame was the artist who drew this sketch of a steam propelled vehicle which he planned to construct, but never completed.



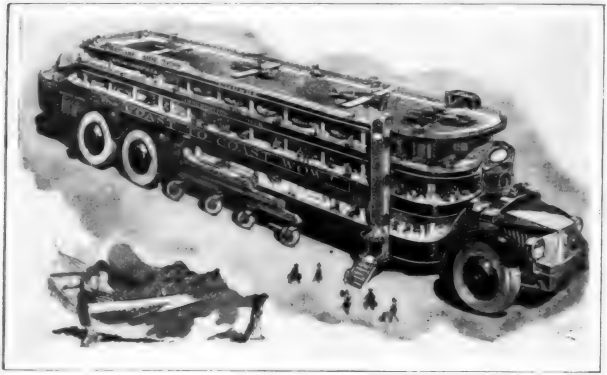
Sea water, from which the harmful salts are removed by the apparatus shown, will be made useful for irrigation purposes if the invention of Thomas Hicks, shown above, proves successful.

One other curious thing about perpetual motion is that I have never heard of a woman inventor wasting time on it, though they are well represented in the practical fields of invention.

As pointed out in previous articles in this series, the only limit to one's success in the field of invention is that set by individual aptitudes and limitations. Bearing in mind always that a simple device is more likely to return a profit to the young inventor than a complicated contrivance, the second factor to bear in mind is that success comes to the man who works in the field he knows most about. For instance, if you are a chemist, the chances are much more probable that something you have invented of a chemical nature will return a profit than if you go far afield.

As an example of the importance of sticking to your own field, take the case of Thomas W. Hicks, Los Angeles agronomist. He has perfected a process for neutralizing the deleterious effect of salt water on plants and is now ready to convert huge quantities of sea water into a nutritious, fertilizing plant food, making use of the natural mineral elements present in the water. The basis of his process lies in treating the sea water with a high frequency current.

Unique Bus of Future to Duplicate Speed of Railroads



Although still a dream, the bus with landing fields, swimming pool and hotel services is not far away.

RECENT developments in everything that moves has caused many flights of imagination. Thus the fancy conjures up a bus to keep pace with other transportation. The bus between New York and San Francisco will be equipped with airplanes for trips not on the regular schedule. For diversion, billiard rooms, swimming pool, dancing floor and a bridle path would be available. The pilot would be "enthroned" over his engines, with the radio above. Space for autos would be afforded by the deck.

Scientist's New Theories May Aid in Forecasting Weather Conditions

Ha'bert P. Gillette demonstrates with globe his electron-magnetic theory, which, he believes, will in time permit of a more accurate forecasting of earthquakes and weather, based on a relative study of the magnetic forces of other planets.

THEORIES which may explain the formation of the earth's surface features, and eventually make it easy to predict both storms and earthquakes, have been evolved after years of research by Halbert P. Gillette, retired engineer and former instructor in science at Columbia University.

Mr. Gillette's hopes for developing the accurate forecasting of weather and earthquakes are based on his new electron-magnetic theory. He believes that since the earth is a huge magnet it must cause the free electrons in the air to revolve in orbits, and that when thus revolving the electrons carry the air along with them.

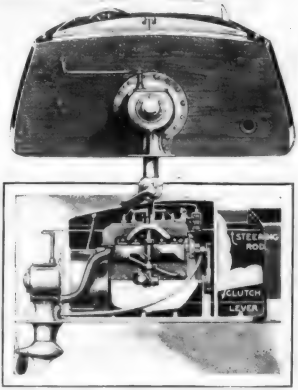
The magnetic forces of the earth and the other planets, particularly Jupiter, which cause these air whirls, also cause a similar whirl in the molten material in the earth, and similarly cause sun spots, Mr. Gillette reasons.

Stern Drive and Reverse Gear for Model A Ford Motors

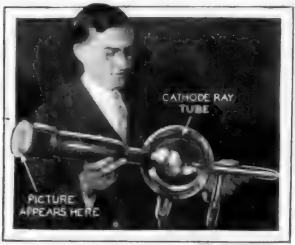
Here is an 18 footer powered with the stern drive Ford motor which can make 25 miles per hour.

WHAT with the outboard motors growing up to such size as to be dangerous to handle, it is interesting to note that predictions made by naval architects several years ago have come true. The leading architects of the country at that time were telling every one that the outboard motor would grow to a size which would make it hard to handle, and that the outboard motor would come eventually to be a motor, inboard, driving the propeller through a shaft going through the bottom of the boat.

The predictions were right. Here we have an adaptation of the well known Ford model A commercial engine which drives a propeller through the stern of a boat by means of a vertical housing containing bevel gears. It is the old idea of the outboard propeller housing with another set of bevel gears incorporated which allows the inboard motor to be hooked up directly forward of the transom, keeping the weights aft, a desirable thing in planing types of boats.



This drive does not require especially constructed boats. All large outboard powered boats are suitable. A wide stern is, however, preferable.



This tube controls billions of electrons traveling 150,000 miles a second, according to Dr. Coolidge.

Invents New Cathode Tube Which Ejects Electrons of Ton of Radium

DR. W. D. Coolidge, of the research laboratory of the General Electric Co., has perfected a type of X-ray or cathode tube by which he is able to control billions of electrons traveling at the rate of 150,000 miles a second. More than 350,000 volts of electricity are shot through the tube producing a quantity of electrons equal to that of a ton of radium. Peculiar results have been discovered in experiments with the new cathode tube, such as changing fluids into solids and killing bacteria in a fraction of a second. The photograph at the left shows Dr. Coolidge with his new cathode tube.

Powerful ground and beacon lights take some of the dangers out of night flying but even these sometimes are not enough.

Thrills aplenty are the lot of the intrepid pilots who carry Uncle Sam's mail through the night. Fog and storms do not stop them. The mail, like Garcia's famous message, must go through. And they do it. A reluctant lot when it comes to telling of their experiences, their stories are rare.

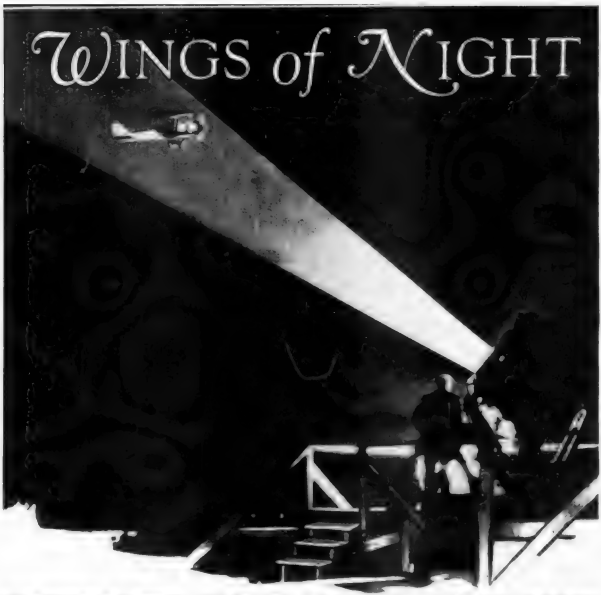
by JAMES NEVIN MILLER

HOW would you like to be a mail pilot, lost at dead of night in a raging snowstorm, where your slightest error in judgment might mean death and the loss of thousands of dollars worth of mail?

Or maybe you'd prefer to aim your plane unwittingly into a live telephone wire, or possibly into the side of a great mountain, thereafter dropping 500 feet into space. And live to tell the tale!

None of these dramatic happenings is the result of someone's overcharged imagination. They are actual experiences which have occurred to members of that valiant flying fraternity who nightly risk their lives so that time, our most valuable commodity, may be cut in half in delivering mail.

One of the most thrilling yarns concerning a night battle with snow and fog is spun by Walter Shaffer, former World War ace, who flies the mail for the Eastern Air Transport between Washington and New York, stopping off to deliver mail at Baltimore and Philadelphia, going and coming. Having arrived without mishap at New York a short time ago, he took off from Hadley Field, N. J., before daylight on his return journey. All was fairly clear until he hit a point just north of Baltimore. Then his troubles began. Not only did a fog spring up, but it started to snow. Nevertheless, he managed to reach Baltimore, dropping off his mail at Logan Field. However, when he headed for Washington the snow kept getting thicker and thicker until he was within only about five miles of the city. Now he had to fly blind, sure enough, for he could not see five feet ahead of him. But he kept right on going, heading close to the ground and trying to feel his way by means of his instruments. However, he fully realized that he'd better not stay too near the ground because of the ever-present danger of striking the radio towers which dotted the countryside every 10 miles or so. At one point he had a feeling that he was over Bolling Field, Washington, and was about to swoop low over what he thought was the field, when he hit into a strong up-current of air. This convinced him that he must be over a hill. However, he kept flying about, feeling his way, until he finally hit the field. Nor was



Like guideposts by the wayside, night flyers turn to these powerful beacons to point out their way. Through a series of signals they keep the pilot informed as he wings his way through the night.

there a thing wrong with his landing, though when he hit the ground, mechanics barely could see his ship. Even at that, his meanders from Baltimore consumed barely 25 minutes.

Another well known flyer on the Eastern Air Transport line is Henry Tindall Merrill, or "Dick," as he is affectionately dubbed. He bears a long gash across one eye and when asked about it, merely smiles and admits that he earned it while achieving probably his greatest thrill flying the night mail. Some time ago, he explains, while flying around midnight over Amelia, Va., his motor suddenly died. This didn't phase him particularly for he knew he could glide to an emergency field located not far from Amelia. Very carefully he maneuvered his plane to a point which he believed was just above some telephone wires which the company had wisely marked with new obstruction markings that were plainly visible. Nevertheless "Dick" suddenly crashed pell mell into something and fell. When he regained his senses he found that he had bumped into some new wires which had not yet been marked. The gash over his eye was caused by a none too friendly contact with the instrument board when the plane hit the ground. This was Merrill's first scratch in 12 years of flying, he says.

An extremely modest young man is Johnny Kytle, another E.A.T. flyer, who flys the night mail between Richmond and

Flyer Crashes Into Mountain, Falls 500 Feet, and Escapes Unscathed

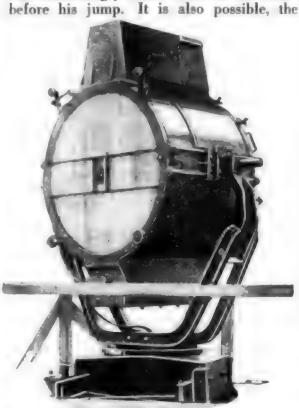
Here are four of the mail flyers who told their experiences to Jim Miller. From left to right they are Edmund (Mike) Matucha and J. B. Story, both N.A.T. pilots, and John Kytle and Henry T. (Dick) Merrill who fly the mail for the E.A.T.

Atlanta. It's mighty hard to get a yarn out of him, but his friend Walter Shaffer claims Kytle is one of the very best stunt pilots in the game and the hero of two of the greatest freak accidents ever heard of. One night not so long ago he flew wide open into the side of Stone Mountain, Georgia, fell 500 feet, and escaped without a scratch. But now comes the real miracle! Barely a month later he duplicated this performance by flying into another mountain and hardly mussed his hair.

But don't get the idea that the E.A.T. flyers have a monopoly on thrills. J. B. Story, pilot of National Air Transport, who flies between Chicago and Kansas City, is the hero of a real-life mystery story that ought to make your ears pop. It seems that at 2 o'clock, a couple of months ago, he left Kansas City with 400 pounds of mail. He made his first stop on schedule at St. Joseph, and was passing over Winfield, Iowa, when a terrific snow storm suddenly blew up. Showing considerable courage, Story manned his ship as best he could, but after some 40 miles of a futile battle with the elements, during which time he was flying blind, and completely lost, he did the only thing possible under the circumstances—resorted to his parachute. Even then he had absolutely no control of where he might land, yet he staked everything on the 'chute and won.

The yarn might end right here except for some strange circumstances that surrounded the case. In the first place, though Story had jumped at 6:13 o'clock, his ship was not found until 10 o'clock, immediately after some farmers had heard the crash. The plane had struck in a pasture, burying its nose in the side of a hill. The natural question arises, what was the ship doing during the period of almost three hours. Cruising about the heavens without a pilot, absolutely at the mercy of the storm? Anyway, the question made Kansas City newspaper men do a lot of conjecturing. They tried to answer why the machine, when found, was ten miles nearer Kansas City than was the pilot after his 'chute had made a safe landing.

One expression of opinion was that either the mail plane had somehow turned itself after the pilot had left it or, confused as a result of his 40 miles of blind flying, Story had unknowingly turned about on his course before his jump. It is also possible, the



Beacons and searchlights have been manufactured that can send a beam 50 miles on a fairly clear night. The candlepower is rated in millions.

The photograph above gives a good idea of a well-lighted airport. The plane taxying across the snow-covered field is representative of the type used in carrying air mail. To the left is a combination wind vane and direction marker. It turns with the wind and at night the lights outlining it can be seen several thousand feet. It is a modernization of the more familiar "sock."

scribes concluded, that the plane did not continue to fly itself as far as its distance from where Story landed would indicate. The machine might have gone down within a mile or so from where it was abandoned, while the pilot, drifting in his parachute at the mercy of the wind, might easily have travelled several miles from the 3,000 feet at which he left the ship. As for the mail, that was found intact.

"Mike" Matucha, also of N.A.T., makes these colorful observations about flying night mail: "Mechanical trouble is the least worry of the pilot. The worst experience I ever had in this connection was during my first week of night flying. All was well until suddenly the radiator burst into flames due to vibration caused by improper hanging. However, I landed without mishap; while the vibration problem later was solved by the simple habit of hanging radiators on rubber mountings.

"On a clear night the landscape is ideal. Lights can be seen for long distances, and the ground likewise, though somewhat indistinctly. On a moonlight night the pilot can take in a wide range of territory. On such a night, with a favorable wind, a stable and responsive ship and a powerful motor humming steadily, there's nothing you'd like better than mail flying.

"When flying at night between Chicago and Kansas City pilots can see an average of two beacons ahead, or a distance of 20 to 25 miles, in ordinary weather. In extremely clear weather there have been times when I could locate six or seven beacons at a stretch.

"A couple of towns along the route in Iowa are marked with the name of the place, but usually I can tell a village at a glance. When approaching it I recognize it as such and such a town in a certain regular route and identify it by the height and grouping of buildings and the general layout of roads and hills.

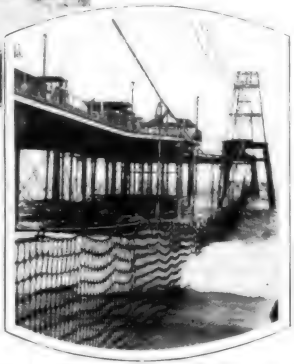
"Flares come in handy when you want to land away from a lighted airport. A flare

(Continued on page 200)

Metal Shark - Proof Nets Protect Australian Bathers

Weighted at the bottom, these strong metal nets protect bathers from man-eating sharks.

THE bathing beaches at Coogee, near Sydney, Australia, have all been equipped with metal, shark-proof nets to protect bathers from the attacks of these man-eating monsters. The nets are made of unusually strong wire netting and weighted at the bottom to keep them even with the surface of the beach. Because of this weight it is impossible for a shark to worm its way through.



Real security rests in these shark-proof nets.

Australia is famous for its water sports and swimmers are constantly disporting themselves at the many beaches and swimming places that dot its shore line. For that reason every precaution is taken to protect bathers against attack.

New Window Designed in England

A NEW type window that is both a boon to health and to easier housekeeping has made its appearance in Great Britain. It permits excellent ventilation and, as it is reversible, it can easily be cleaned either from within or from the outside.

The window is held in place by two metal extension arms. The lock is in the frame and can only be opened from within the house. It is a sliding bolt mechanism.

Clear vision is assured in this single pane window. The frame is reversible and can be cleaned easily.

Knob Rids Hen's Nest of Snake

AN IVORY colored door knob was used by a Tyler, Texas, farmer in freeing his chicken house of a huge chicken or "bull" snake, that for months had robbed the nests of eggs. The farmer placed the knob, which was about the size of a hen's egg, in the nest. The knob disappeared and a few days later the snake was found dead with the knob in its innards.

Safety Signal Warns Approaching Cars at Intersection

A NEW safety signal, that reflects the headlights of an approaching car in all directions, has just made its appearance at street intersections in San Francisco. It is called the "Copalite Lookout" and is the invention of a Californian.

The signal is solidly made of cast iron rounded at the edges and without rough corners and is not so high that it interferes with traffic. Cars accidentally hitting it ride right over it without damage to tires. It is bolted into the roadbed through a central bolt.

The reflections from approaching automobiles are picked up by the Copalite and through a series of glass squares and mirror-like reflectors thrown to the right and left.

The headlight beams of cars approaching street intersections equipped with the Copalite reflector recently tested in San Francisco are picked up by a series of mirror-like reflectors and thrown in three directions.

Russell Develops New Type Easy Flying Small Plane That Is Fool-Proof

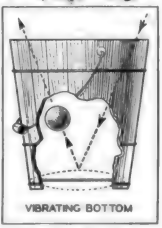
AMONG the main features of this new Russell fool-proof small plane is the ease with which it flies. The ship has several patented features which make it very stable and will not fall into a spin and if forced into a spin will stay in only so long as it is held in by using all controls. The ship will fly "hands off" regardless of its extreme light weight. It has been flown in a fifty mile wind and behaves nicely under those conditions. Under normal conditions it will land in a space of 100 ft. square.

This plane is 23 ft. 10 in. wing span, 5 ft. chord, 18 ft. 11 in. from nose to tail, and is powered with a 3 cylinder, 35 h.p. motor. It weighs 407 pounds and is 6 ft. high. It will take off at 45 m.p.h. and will land at 20 m.p.h. Cruising speed is 75 m.p.h. with top speed 120 m.p.h.

How Carnival Games

By
SAM BROWN

Did you ever wonder why you came home from the carnival empty handed? Remember how you tried to ring the bell by hammering the catapult or how you tossed ring after ring trying to win a cane? Swindled? Well, maybe! Read how the operators "gimmick" their games so that you can't win. It may save you money or help you win.



Ball-catching buckets can be fixed so that the ball will always bounce out.

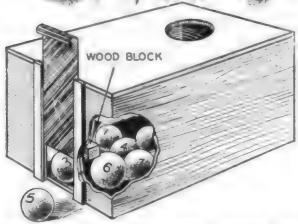
CARNIVALS carry with them many devices which are absolutely guaranteed to flatten the pocketbook. There are a score of games—all "fixed" so that the operator has them under control at all times—all "sure things," but *not* for the benefit of the public.

Perhaps the best known is the paddle wheel. These are often played on the square, the operator depending on getting a full play at ten cents each, and then awarding a cheap prize. All wheels, however, can be altered instantly in order to increase the percentage for the owner. This is usually done by friction. The paddle wheel is controlled by a wire rod which runs up to the hub of the wheel. By pressing a hidden lever, the operator can cause the rod to press against the hub, and thereby stop the wheel on a non-winning number. Technically, these outfits are known as "squeeze spindles"; and when operated so that every other number calls for a worthless prize they are known as "slum spindles." There are many variations of the game. Occasionally it is a simple cardboard table spindle so that its very crudeness seems to warrant its innocence from guile—but—in every case, you will find the hidden lever.

Ever play the bucket game? The idea is to throw balls into the bucket in so many attempts. Try and do it! Every bucket has a turn screw on the bottom, adjusted so that it will positively throw out the ball with which the game is played. Of course, the "capper" is allowed to win and occasionally the operator gets generous enough to allow some outside person a fair chance of winning. There are many varieties of this swindle. One uses but a single bucket mounted in the center of a closely-woven net. The tautness of the net makes it impossible to pocket the ball. In another type the bottoms are hinged so that they can be deflected upwards and downwards. With the bottoms

CHEAT CUSTOMERS

Illustrations drawn by Reynold C. Anderson



The block prevents your winning. The balls look alike but there is a slight difference. The smaller non-winners roll out. The winners remain.

flat, the player has no chance whatsoever, but by pressing a lever, the "barker" can deflect the bottoms slightly, causing the ball to strike the inside on the rebound and then stay put.

Another game "gimmicked" is the hoop toss. In this, the prizes are mounted on square pedestals. The player is furnished with wooden rings somewhat like crochet hoops, and with these he attempts to win by completely "ringing" the pedestal. Of course, he has no trouble in eventually winning one of the "slum" prizes, but it is next to impossible to ring any of the more pretentious gifts. The reason is simple. The rings are slightly elliptic in shape, so that their smaller diameter is just the least bit lacking. The operator pressing the ring to a more rounded fullness between his thumb and fingers, easily slips it over the prize in question.

Of all games "spot it" is one of the few that is actually played "on the square." It is quite simple. The operator presides over a large disk painted on top of a small table. You are handed five smaller disks and attempt to completely cover the large disk. The disks cannot be moved once they are placed in position.

It's simple—the operator shows you how. But when you try . . . always there is that little bit of uncovered space peeping up at you . . . laughing! Of course, there is no "gimmick" in the game. The basic principle is one of geometry. There is only one way in which the small disks can be placed to completely cover the large disk. Any deflection will result in failure. The "barker" has certain marks on the large disk, discernible only to himself, which guide him in covering the disk completely.

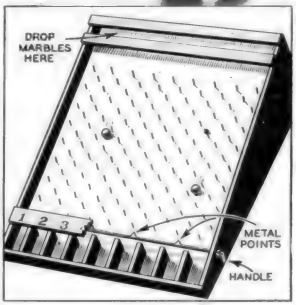
There is nothing so sure, for the operator, as the ball and box outfit. In this one the operator exhibits a box in which are numbered balls. Corresponding to the numbers is the prize rack—a "slum" affair displaying valuable and worthless prizes. You buy a chance and the operator opens a small door in the box and lets out your ball. You immediately spy the number and turn eager eyes towards the prizes to see what you have won. It invariably happens that you have drawn a non-winning ball.

Few Carnival Games of Chance Give Player an Honest Winning Break

The nigger in the woodpile is that the balls are of two different sizes. The non-winning balls are the smaller size. The game revolves around one point, as far as the operator is concerned. If he can release these smaller, non-winning balls, the company is ahead. Well, he does! The method is absurdly simple. To the inside of the box is fastened a block of wood. The small balls will slide under it, but the larger balls cannot. When the barker shakes the box, he waits until he feels a ball striking the tin door. This he knows to be a non-winning ball and he releases it at once. When business is good the operator subtly contrives to allow a player to win occasionally, and in this manner spurs on doubting spectators.

Another popular game is the "Test Your Strength" device in which a lever, when struck by a hammer, catapults a rubber marker up a steel wire. Actually, physical strength has nothing to do with it—a girl can send the marker to the top while the "village blacksmith" might hammer all day and never reach the top. The reason is that by resting his foot on a lever the operator can make the wire taut or loose as he desires. Therein lies the secret. When the wire is tight, the marker goes crashing into the bell; but when the wire is loose, it encounters enough friction to retard it.

Even the "toss a ring and win a cane" game and the lesser-known "knife pitch" are tricked. The faking is in the ring, this being weighted on one side so that it will fall at an angle. The better prizes, too, are usually packed so close that it is impossible for the ring to encompass any one of them.



A twist of the little handle at the bottom and your marble drops into the losing pocket. The metal points block the way to the worthwhile prizes and add your dime to the operator's profit.

Other simple games come in for their share too. The cats and the squat bottles that you throw baseballs at are often loaded

The paddle wheel, as a general rule, is squarely run for percentage favors the operator when he has a spending crowd. However, it, too, can be "gimmicked" as the drawing shows.

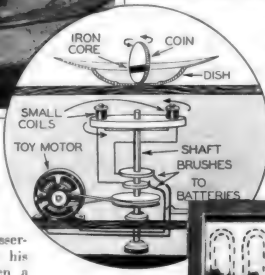
so that they can withstand a terrific impact and still remain standing. The grinning "nigger babies" have been hammered so consistently in previous seasons that they present a total solid area of about three square inches, the rest consisting of gaudy edging through which the ball whizzes without effect.

The "drop case" too is quite popular. The carnival uses it as a "slum" affair, one-half of the numbers winning. You drop your marble in at the top of the case and allow it to roll down through the maze of small pegs. At the end it drops into a numbered stall and it is not unusual for it to land consistently on the non-winning numbers. A concealed lever does it. By giving it a turn the operator erects a barrier in front of winning numbers.

Make sure that the uprights supporting the rope are solid and that the rope is not twisted and you have a chance of bowling over the pin. Don't let the operator hand you the ball.

The "pin and ball" outfit consists of a bowling pin over which is suspended a ball on a long rope. The idea is to swing the ball forward, miss the pin, and then knock it down on the reswing. By twisting the rope or through loose uprights you will always lose.

AMAZING DEVICES LURE



The dollar spinning on the plate above is operated as shown in the diagram at the right after an iron core is concealed in the coin.

HOW to get the passer-by to look into his window has long been a paramount problem with the window displayman. He employs sparkling lighting effects, gorgeous creations of crepe paper artistry, unusual devices, flaming posters . . .

You pass them by with a casual eye.

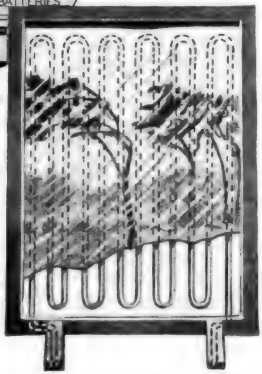
And then . . . along comes the trick window display. An ingenious merchant has placed on exhibit a glass plate. Nothing unusual about that. But . . . on the glass plate is a silver dollar which is, without any visible propelling power, slowly waltzing around the plate in an upright, spinning position! It catches your eye. The subtle, psychological force of advertising takes hold. And there you are.

Merchantmen employ hundreds of similar devices. Most of them are simple mechanical or electrical effects which can be installed at a minimum cost. On this page is pictured the explanation of the spinning dollar. Two small coils mounted on a horizontal arm are rotated by means of a small toy motor concealed beneath the floor of the show window. The dollar contains the all-important "gimmick." This is in the form of a light iron core which has been carefully inserted in the coin a trifle below the center line, as shown in the sketch.

That's all there is to it! The motor is started going, the coin is hand-spun on the plate, and there it spins through the live-long day for the benefit of passers-by.

The perpetual motion myth figures in more ways than one in window displays. Many banks now have on display a clock similar to the one shown herewith. What makes it go? You step a bit closer to examine it. The advertising line, "Time to Start an Account," comes into your range of vision. It registers. The "silent salesman" scores again!

The mechanism of this clock is simple. Did you ever hold the drive shaft



Trees of the picture above are chemically painted so that the picture is revealed when heating unit is on, and strangely disappears when heating wires are cooled.

Store Window SHOPPERS

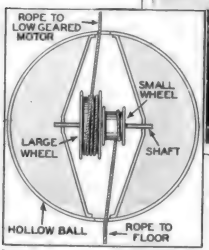
of an alarm clock in your hand and let the motor turn the clock around the shaft instead of turning the hands around the clock face? That explains this clock. In the round knob at the end of the minute hand is concealed a small watch with the drive shaft connected to the minute hand of the large clock. A weight in the form of a small compass keeps the small watch in a fixed position, so that its energy is directed towards making the minute hand of the clock rotate. Although simple enough, the principle of the thing is rather difficult to grasp. Perhaps that explains its popularity!

This clock, seemingly without works, is run by a watch which is concealed under the minute hand.

Many years ago, an ingenious magician invented the "Obedient Ball." It was merely a ball threaded on a piece of string. The ball would rise and fall at the performer's command. It was a good trick.

Now the window displayman has adopted it. He inscribes some simple little advertising sign on the ball, threads it on a rope which runs from floor to ceiling in his window, and then starts the ball on its never ending chase from the ceiling to the floor, up and down the rope.

Above is shown the obedient climbing ball.



Here is a cross section view of the obedient ball showing wheel and rope arrangement inside which causes ball to climb up and down at the operator's will.

The method is extremely simple. The ball is hollow and contains two wheels, a large one and a small one, as shown herewith. The rope is not one continuous piece, but two separate pieces, one of which (the upper) is wound around the large wheel; the other (lower) the small wheel. Physics does the rest. When the rope is slack, the ball will fall; when the rope is tight, the ball will climb. The slackening and tightening motions are done by means of an eccentric disk which is connected to a low-geared motor above the ceiling of the window.

Among the many unusual and beautiful picture effects which displaymen have created, the Electric Picture still holds forth as the most mysterious. In this display, a colored picture slowly appears on a white sheet of cardboard, and then slowly disappears again at intervals of two minutes.

Here's Another FLYING CONTEST Winner

HATS off, fellows, to R. E. (Speed) Ringle! He is the winner of fifth MODERN MECHANICS Win Your Wings Contest and deserves it. He rode roughshod over some 2,500 contestants to annex the free complete flying course that is offered to MODERN MECHANICS readers every month for answering a few questions. Speed is 18 years old and lives at 6020 Drexel Avenue, Chicago. He admits quite readily that he is a "bug" on anything that savors of the air and is a real hangar "hound" as his picture well demonstrates. Speed has not as yet selected the school to which he would like to go but it will be one of the recognized training schools of the country. And when he starts out on this momentous point in his career all of his expenses will be paid by MODERN MECHANICS. He will be equipped with goggles and a helmet, have his fare and living costs paid and his tuition arranged. Literally, all he has to do is hang up his hat and go to work learning what there is to learn about the air and aircraft so that when the time comes for him to take the stick he'll be prepared.

Another 18-year-old carries off second honors this month. The prize—an honest-to-goodness flying helmet—goes to Julius F. Doering who makes his home in Parkston, South Dakota. J. F. gave the winner a pretty close race and just missed by a proverbial hair. However, Doering did not have it so easy either. When it came to a race it was almost a toss-up between the Parkston youngster and Ralph J. Krasky, Minneapolis entrant. After considering all angles of the two sets of answers it was finally decided by the judges that Ralph was beaten by a nod. Krasky, therefore, gets a pair of flying goggles and the distinction of winning third place.

From top to bottom we see R. E. Ringle, J. F. Doering and R. J. Krasky, winners of Contest Five, in the order named.

The WIN YOUR WINGS CONTEST is open to all readers of MODERN MECHANICS. Every month until further notice a free complete flying course with all expenses paid, is offered by this magazine for the best answers to a series of six questions. You will find them scattered throughout the advertising section in the back of this issue. They are not hard to find nor are they hard to answer. They are questions pertinent to aviation and its development. Look them up and try your hand at this interesting pastime. You can win a free complete flying course if, in

There's Still Time for YOU!

the opinion of the judges, your answers are the best.

In answering these questions you don't have to write long statements. Simplicity is one of the main considerations. That, together with neatness, originality and adequacy of answers will be the guiding factors of the judges in determining the winner. Remember, there are six questions to be answered. When you have finished answering them, cut out the entry blank, fill it in and attach it, with a snapshot of yourself, to your answers. Then send it on to MODERN MECHANICS, plainly marked for entry in Contest Number 9. The closing time is midnight, June 15th. Your letter must be postmarked before that time to earn consideration. The winner will be announced as soon after the closing day as possible.

You have the same chance to win as Slemmer, Sweeney, Dumas, Risco or Ringle. They have won previous contests and all will tell you that the questions were not so hard. Try it today! Seek out the questions and get your answers started. The contest closes on June 15th at midnight and your letter must bear a postmark prior to that time to earn consideration. Get busy and take a crack at winning your wings at the expense of MODERN MECHANICS.

WIN YOUR WINGS!

Rules of the Contest

For the best answers to the six questions that can be found in the advertising section in the back of this issue, as determined by the contest judges, MODERN MECHANICS will award a complete flying course in some recognized flying school, paying all expenses of tuition, living costs, railroad fares and for some needed equipment in the form of helmet and goggles. Neatness, originality and adequacy of answers will be the guiding factors of the judges in determining the winner. It is not necessary to be a yearly subscriber to the magazine.

Anyone may compete who is 16 years of age or over, and a resident of the United States or Canada. Members of the staff of this magazine are, of course, not eligible to enter. Address your letters to Flying Contest No. 9, Modern Mechanics Magazine, 501 Seventh Avenue South, Minneapolis, Minn. Entries must be postmarked not later than June 15, 1930, to be eligible for this contest. Clip or copy the entry blank below and attach it to your letter. Fill in the information requested. Include a snap shot of yourself, if possible—a big photo isn't needed; just a kodak print.

It is not necessary to buy a copy of the magazine to compete. In case of a tie, duplicate prizes will be awarded. Fill in the entry blank, answer the questions and send in your entry now. Don't forget to include your photo!

Entry Blank

My name is .....

Address ..... City ..... State .....

Age ..... Height ..... Weight ..... Sex .....

If under 21, please answer the question below:
Will your parents consent to your learning to fly? Parent's signature .....
Attach your answers to the questions, and your photo, to this blank. Mail it before June 15, 1930, to

FLYING CONTEST NO. 9
MODERN MECHANICS MAGAZINE
501 SEVENTH AVE. S., MINNEAPOLIS, MINN.

Thrilling Water Sports

By DICK POPE
Outboard Stunt King

Aquatilting—bathing-suited knights jousting with padded 8-foot lances.

Dick Pope and his brother, Malcolm, share between them just about all the worthwhile racing records for outboard motor boats. In this article Dick Pope describes the thrilling water games invented by him and his brother, and shows you how you can enjoy them.

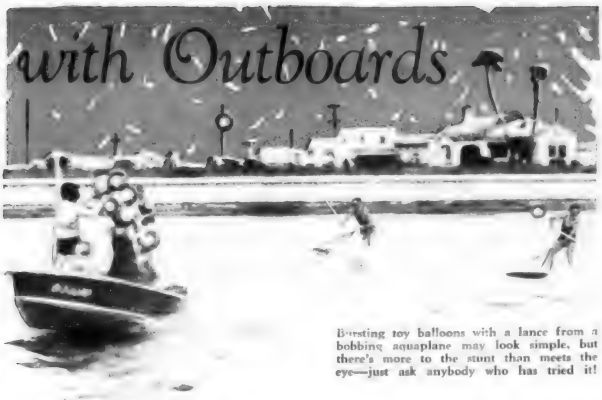
AFTER being around boats so much for the past few years, my brother Malcolm and myself have discovered that a lot of fun can be had from the accessory sports and have worked out for the first time a good many new games which can be played with outboard boats on the water. It was impossible with the former slow and big boats to maneuver quick enough to play games, but now since the outboard boats have become so popular that they are being used on all the lakes, rivers and bays it has opened a new field of sport.

One of the first games we tried was balloon-"busting" in which the fair lady passenger tosses toy balloons high up in the air and the aquaplane rider, equipped with a lance, spears the balloons and punctures them as they come toward him. These little balloons cost practically nothing when bought wholesale and with a good stiff wind blowing it is quite a trick to burst them.

Next, we found that we could have a lot of fun aqua-tilting as they do in canoes, only the action is ten times as rapid, and here we used 3-foot bamboo fishing poles with a wad of padding on the end enclosed in rubberized cloth to keep the padding from absorbing water. This sport makes you watch your step every minute, as you have to cross the wakes from the two boats sometimes to get at your opponent.

Then we tried as thrilling a sport as one can do with aquaplanes, and that is aquaplane jumping from an inclined platform. After trying it for awhile with an ordinary aquaplane we then put rubber horses on them and did some fancy steeplechase jumping. Many times we accidentally imitated the Prince of Wales. Then sometimes the spectators would ask us whether the water was cold, and we would say we hit it so hard that we never knew whether it was cold or not, in fact hadn't thought about it until they mentioned it.

Our jumping platform is built according to the sketch on page 96, and by merely weighting the back end we can make it higher and lower at will. Generally we start with about a 20 inch jump and increase it



Bursting toy balloons with a lance from a bobbing aquaplane may look simple, but there's more to the stunt than meets the eye—just ask anybody who has tried it!

until it gets to around four and five feet. We have been using lately the metal outboard runabouts on account of their strength. They will stand any kind of abuse and pull the aquaplane at about 30 miles per hour. We find that an aquaplane if kept perfectly level on the water will only slow the boat up a mile or two per hour and if the rider will be very careful always to keep the board as level on the surface as he can by riding forward and not tugging too hard on the ropes so that the front part is up in the air and the rear dragging in the water, then even the smaller motors will pull them.

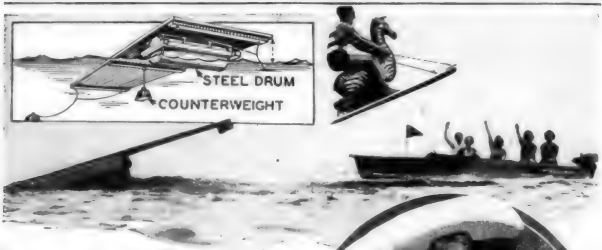
When you are jumping have the towing boat run as close alongside the jump as possible, within at least two feet, and as it nears the platform the rider should pull his board over to the side and get his feet as far forward on the board as possible, then just before he hits the jump take a short hold on each line and hang on for dear life as he goes up the platform and through the air. The trick when landing on the water is to keep your eyes and mouth closed to avoid spray and to keep pulling as hard as you can on the ropes. No matter if you are bounced away over on one side so that your arm and face are in the water, if you keep pulling you will come back up.

Then we came to aquaskiing, which is even more thrilling sport than aquaplaning, as it is performed on specially made skis greatly resembling those used by winter sportsmen. After you become used to riding the skis it will be still easier if you get a set of carpet slippers to mount on the skis so that you can put your feet in the toes and not have to worry about your feet slipping off if you hit a big wave.

One of the games played with skis makes use of a long lance and a series of hoops light enough to float upright on their sides, one section of the circumference being weighted. The contestants ride along, lances in hand, and try to spear the hoops tossed out by girls riding in the boats ahead of them. Hoops are tossed first on one side of the boat and then on the other. Each rider has a quota of six hoops for each game and the one spearing the most, wins.

We also jumped these skis over the regular jumping platform which we used for outboard motor boats and aquaplanes, and here you get a real thrill as you fly through the air for 15 to 20 feet, sometimes going five and six feet in the air. This is perhaps the most difficult feat we have tried so far. Some of our boys have been able to do it perfectly and others are not so successful.

One of the most important things to learn in aquaplaning or aquaskiing is that you should be able to get on either of them without getting wet. The way to do this is



The insert drawing above shows a satisfactory method of constructing an inclined platform for aquaplane jumping. By moving the counterweight toward the rear a steeper angle of the board, and consequently a higher jump, results. The photo shows a "dolled up" aquaplane just after it has skimmed over the hurdle. Note the rope leading to the outboard towboat traveling at a 40-mile clip.

Dick Pope, famous outboard stunt king.

to sit on the edge of a boat or dock, putting the rear end of the aquaplane or skis partially under the boat or dock, placing your feet in the proper riding position and taking a short hold on the ropes. When the boat starts moving remain seated until the line is taut and starts away and your board or skis start moving; then just simply stand up on them, and from then on, outside of getting a little spray on you, you don't have to get wet. When you come in, have the outboard that is towing you bring you alongside the dock and you can spring up on it without much effort.

Another game that requires considerable dexterity is aquaplane archery, and this can be played by either putting the target on a dock and riding past, or else making a special buoy to hold it. The arrows of course, float and are easy to retrieve, the game being that each rider is furnished three arrows and they each have their targets. If the targets are placed on a buoy the players ride by 20 feet away and if they miss they have to retrieve their own arrow by stooping and picking it up out of the water while riding past without slackening speed.

The jumping platform which I have mentioned can be made out of one-inch dressed board, each board running the length of the platform. Any length board is all right so long as the platform is at least eight feet wide and fourteen feet long. It should have two barrels under one end, or preferably, about two-thirds of the way forward. These can be of metal or wood and merely tied and held in place with rope unless a more elaborate platform is wanted.

Another thrill we have had with aquaplanes is riding behind a seaplane at 50 miles an hour, and at times when the gust of the propeller is particularly strong our aquaplanes take off and will go three or four feet in the air with us. This we tried several times in Biscayne Bay at Miami, where during the winter we do most of our aquaplaning.

This coming year the National Outboard Association, who are sponsoring many new sports in conjunction with outboards, are expecting to publish a book on various games which Malcolm Pope will edit.

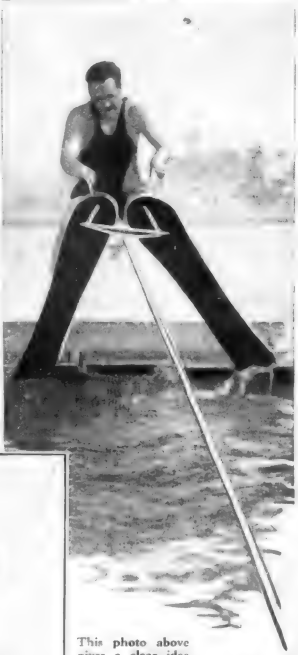
Outboard racing has developed surpris-

ingly fast in the last ten years, having now attained the status of a national sport, with national officers, a national schedule, and a common set of rules. The cost of racing varies with the individual driver. A clever mechanic can make a second hand motor and a home-made hull carry him no inconsiderable distance. A good stock racing hull will average $250 and a new racing motor costs from $180 to $375. Spare parts and replacements add 50 per cent to these figures.

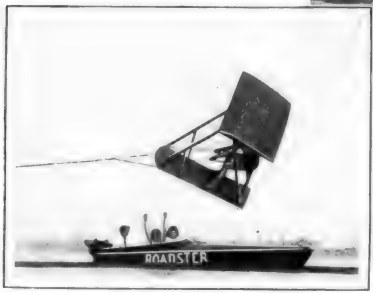
Prior to 1925 the highest record speed was in the neighborhood of 10½ miles an hour; in that year, with the coming of the first high-speed motors, it jumped to nearly 17 miles. Constant improvement in boats and motors has moved this figure up in the neighborhood of 44 miles an hour. In racing motors nothing matters but speed, and speed is largely a matter of eliminating all avoidable friction. The skill of the drivers in polishing and balancing their motors to the nth degree contributes as much to their success in setting new records as do actual improvements in design.

At the more important regattas the course is 2½ or 3 miles long and a race consists of three heats of two laps each. The motors are classified by piston displacement and all motors of a given size are started at one time. Copies of the racing rules can be obtained on application from any outboard motor manufacturer or from the National Outboard Association in Chicago.

Water Skis Test Sense of Balance



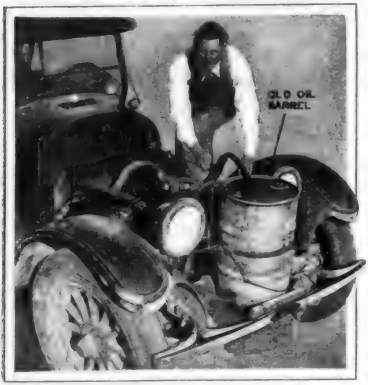
This photo above gives a clear idea of the construction of a pair of aquaskis, and shows the method of mounting them for attaching to the towboat. There's no danger of sliding off if you hold the ropes tightly.



Action shot of a water glider with which the Pope brothers are experimenting. The wing is mounted on an aquaplane.

At all events at which new records may be established an official referee of the National Racing Committee is present. The rules give you every possible chance to make your equipment equal to the best, so you have just as good a chance of winning as the next fellow.

Trick Radiator Saves Brothers on Six Hundred Mile Jaunt



Resourcefulness and an oil barrel is all that A. E. Lyons needed to get his car home after two radiators had been cracked.

AFTER freezing up two perfectly good radiators on their car during a jaunt from New Mexico to California, the Lyon brothers — Alf and Bert — rigged up this oil barrel cooling system and traveled the last 600 miles in state.

The barrel was wired where the radiator should go and the radiator connections were soldered to the drum. It took a bit of experimentation because the contraption ran hot for a while and melted off the petcocks on the cylinder heads blowing the water all over the car. But finally it worked just right and the two lads drove all the way from Winslow, Arizona, to Los Angeles, behind the rattlely-bang of their tricky, yet useful, cooling plant. They had been out in the mountains near Santa Fe inspecting mining property with the thermometer kicking around well below zero.

Advertisers Turn Mechanics in Devising Attention-Getting Novelties

WITH advertising experts daily striving to find new and novel methods of winning attention for their products it is not hard to see that inventive minds would sooner or later try their hands on making sales slogans into something with a tangible form. Two cases of such ideas are shown in the accompanying illustrations.

The nail is in reality a pencil that has been perfectly made to resemble—both in size and finish—the type of nails used in fashioning the products of the advertiser. In addition to the name of the company

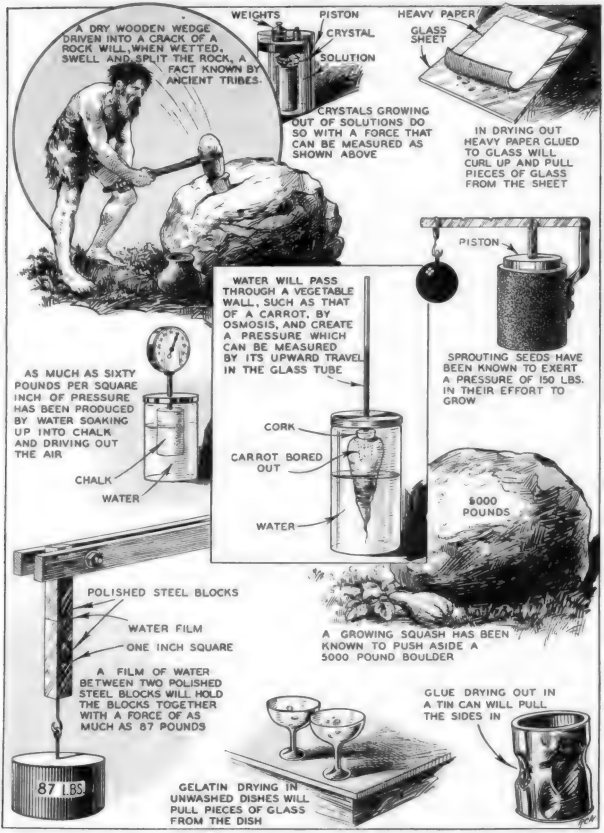
You don't know what it is until you take out the plug. And, while you are enjoying it you cannot help but read the firm's advertisement.

The nail-pencil is another idea that wins support because it has enough novelty to make it worthy of further showing. It also tells the story well.

and a listing of the products in which this type of nails is used the nail-pencil carries the inscription that the articles are "solid copper nailed."

The reliable cigar lighter serves both as a little joke and the more utilitarian purpose of supplying a match when needed. It is a hollowed piece of wood no larger than one of those automatic contraptions, as the match in the picture demonstrates. A wooden plug keeps the match from falling out and further adds a bit of mystery when it is first handed about for inspection.

Little Forces Which Help Run the World



A modern Robinson Crusoe, cast on a desert isle, could raise water, could split rocks, and could mine quartz (glass like mineral) by applying drying gelatine to a vein so as to leave the metallic minerals untouched through the use of the knowledge to be gained by these little reminders.

Edited by MAJOR H. H. ARNOLD

Wichita Becomes the Nation's Aircraft Building Center

IF a person could predict the direction in which modern cities were going to extend their boundaries and build up he would become a millionaire without the least difficulty. If anyone had said several years ago, that Wichita, Kansas, was going to be the largest aircraft production center in the United States, he would probably have been ridiculed. However, today, that Kansas city is the aircraft manufacturing center of the United States. Economically it is rather hard to figure out just how this commercial airplane activity started and how it continued to grow so that today there are six companies building airplanes and two building engines in a rather small Middle West city of about 120,000 people. The industry started in 1919 with the Laird Company, manufacturing the Swallow airplane. From then on the industry grew like a mushroom.

In 1925 the organization split and the Travel Air Company was formed and produced the Travelair plane. Two years later the Stearman Company was formed by some of the Travelair organization. Thus there were additional organizations available for other companies as the personnel obtained experience in aircraft production. Today there are in Wichita the following airplane companies: Swallow Company with a production of about 7 planes a week; Travelair Company with a production of about 20 planes a week; Stearman Company, Laird Airplane Company, and Swift Airplane Company with a production of about one plane a week; and Cessna Company with a production of about three planes a week.

Major H. H. Arnold

is a recognized authority in the field of the airplane, being the author of a number of widely accepted text-books on aeronautical subjects, as well as a practical flyer of long standing. He served as assistant chief of the American Air Service during the World war.

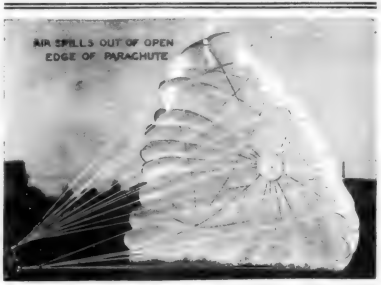
Wichita has six flying fields, several flying schools and an active flying club. Other cities have one or possibly two companies operating that produce probably more airplanes than any one company at Wichita, but none produce as large a total.

The airways net in the U. S. now extends from Boston to San Francisco and from Minneapolis to Galveston. The increase in mail carried on these lines has varied between 17% to 150%. The increase in mail and express has been so great that some companies have been compelled to refuse to carry passengers until they can secure more planes.

During 1926 1,500,000 miles were flown over the mail routes during the day and 984,000 miles at night.

Triangular 'Chute Descends Slowly Without Wobbling

THE first change in the shape of parachutes since their invention by Leonardo da Vinci in 1450 was brought about a few months ago by Major E. L. Hoffman, parachute expert, who has invented a 'chute of triangular rather than hemi-spherical shape, as shown in the photo at the right. Advantages of the triangular design are claimed to be slower descent through the air and a considerable reduction in the oscillation of the 'chute during its downward trip. In the ordinary parachute with circular edges the air imprisoned within the silk is forced out around its edges as it descends, imparting a swaying, oscillating movement which on long descents has been known to cause all the distressing symptoms of seasickness in the jumper.



This newly designed triangular parachute permits the air to escape evenly from its three open edges, thereby eliminating the oscillations produced in the conventional circular 'chute by air forcing itself under its edges as it descends to earth.

The triangular design eliminates this trouble, as the photo shows, by providing three open edges where the sides of the parachute come together. These permit the air to escape freely without disturbing the downward progress. Tests made by Major Hoffman have also demonstrated that his parachute drops to the ground more slowly than the hemispherical variety.

It is interesting to note that the parachute was used only by a few exhibition balloonists prior to the World war, when its possibilities as a life-saving means for airplane pilots were first demonstrated by the Germans, who in the last days of the war equipped their fighting airmen with parachutes so that they need not go down in flames when their planes were put out of commission by the enemy. Today the role of the parachute as life-preserver of the air is so taken for granted that it has become a taken-for-granted piece of standard equipment.

Parachutes can lower surprisingly heavy loads to the ground in safety. An incident is on record where a balloonist fitted a large platform to his gas-bag, on which he placed a horse on whose back he rode. At a given height he cut loose the platform, a large parachute opened up, and horse and rider descended gracefully to the ground.

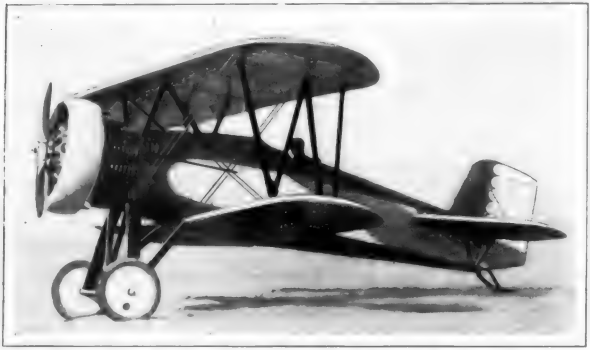
Fuel Transfer During Flight

ALTHOUGH the actual mechanics of transferring gasoline from one airplane to another during flight would seem to be quite simple, there are many details which must be worked out to prevent fire in the air, injury to the crews from gasoline burns and the refueling hose becoming tangled in the structure of the planes. The location of the tanks in different types of planes requires a separate study to be made for each such flight.

Generally it is not possible to transfer the gasoline direct from the hose to the tanks of the endurance plane. These tanks are generally so placed that they are too close to the propeller or are inaccessible to the crew. This necessitates that long receiving pipes leading to the tanks be installed or that additional tanks be placed in positions where the hose can be inserted by the crew.

If these pipes are large enough and have no sharp angles, the gasoline runs freely into the tanks and there is no danger of its splashing in all directions, but when the flow of gasoline is suddenly retarded by screens, bends in pipes or small tanks, some device must be installed to prevent splash. In some recent tests this has been done by providing a thick rubber washer into which the nozzle of the hose fits quite snugly.

World's Fastest Fighting Airplane Tested for U. S. Navy



Note the clean streamline design of this new Boeing plane, which is the world's fastest fighter.

ARMY and navy pilots at San Diego, California, recently tested this new fighting airplane, known as the Boeing 100, which attained a speed of 196 miles an hour at an altitude of 8000 feet. This is faster by about 25 miles an hour than any previous fighter. The ship is powered with a 425 h.p. Wasp motor. The additional speed is attained through cleaner design of the plane, installation of a Townend ring around the engine to streamline the cylinders, use of smaller wheels, an improved landing gear, propeller of new design, an engine with a higher compression ratio (6 to 1) than used heretofore, and a supercharger which carries sea level atmospheric pressure to the engine at an altitude of 8000 feet. The Townend ring alone adds 10 miles an hour to the plane's speed, while the other factors account for an additional 15 miles.

Learning to Fly Blind

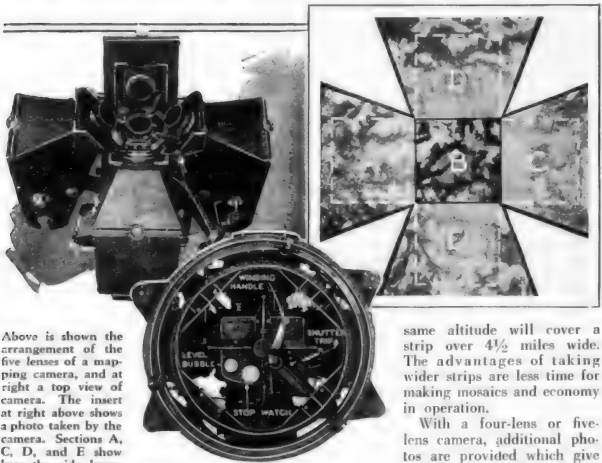
AS EARLY as 1914 it was apparent that some special instruction must be given to pilots so that they would be able to retain control of their planes even though the ground was completely cut off from view and the pilots lost all sense of direction. In those days the airmen did not intentionally fly into thick clouds, try to force their way through heavy fog or keep on their course when heavy rains or snows were encountered, but occasionally they found themselves in the air under one of those conditions in spite of everything that they could do.

There have been two practical tests to see just what the pilot would do under those conditions. The first is rather a simple one. It requires a bank and turn indicator, a whirling chair and a victim. The pilot is blindfolded and placed in the chair with the bank and turn indicator in his hands. The chair is then rotated. After a while the chair is stopped and the pilot asked how he is moving. Almost invariably the pilot will indicate that he is moving, in spite of the fact that the instrument proves that he is not.

The other test was first tried out by Dutch aeronautical scientists. They rigged up a biplace airplane with the rear cockpit covered with a removable light-proof top. A complete set of instruments was made available for the airman in the rear cockpit.

After taking off and securing a safe altitude, the controls were turned over to the airman in the rear seat. Ordinarily it requires about thirty minutes of blind flying before the pilot in the rear seat will believe that his instruments are right.

Multi-Lensed Camera Extends Range of Mapping Planes



Above is shown the arrangement of the five lenses of a mapping camera, and at right a top view of camera. The insert at right above shows a photo taken by the camera. Sections A, C, D, and E show how the side lenses take distorted pictures which must be rectified to conform with photo B, as indicated by dotted lines.

ALTHOUGH the wide use of aerial mosaics came but a few years ago during the World war, they are now considered a necessity by all military powers and have a widespread employment in commercial activities. The accuracy of these mosaics depends greatly upon the control points available on the ground, the amount of overlap between pictures, and the care and precision with which they are put together.

Naturally the more control points that there are available on the photographs, the more accurate will be the mosaic. The multi-lens camera such as is shown above furnishes more photos which have control points for checking, and also makes it possible to take a much wider strip with each run of the plane.

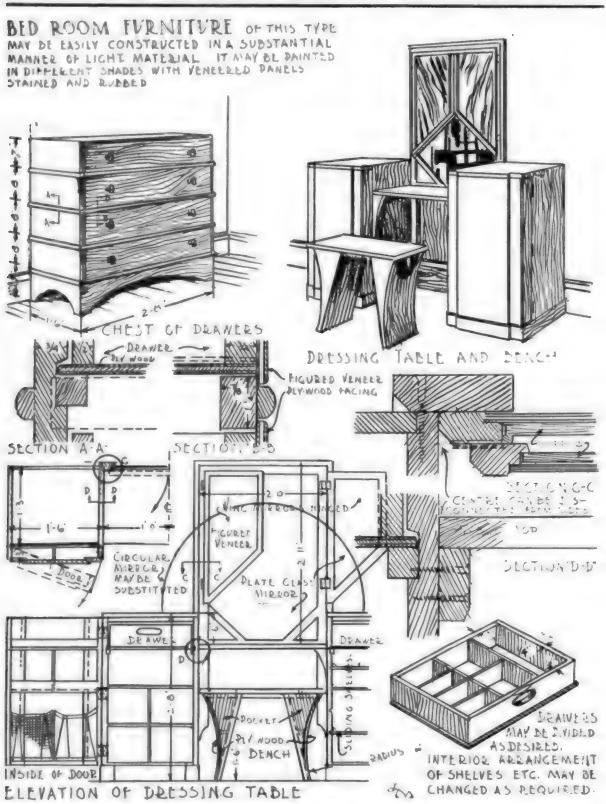
From an altitude of ten thousand feet a single-lens camera will take a picture which covers a strip on the ground about 1½ miles wide. The tri-lens camera from the same altitude will cover a strip over 4½ miles wide. The advantages of taking wider strips are less time for making mosaics and economy in operation.

With a four-lens or five-lens camera, additional photos are provided which give additional points for checking when the mosaic is laid out. It is possible for a single point to appear on as many as six different pictures taken by a four-lens camera. Each appearance gives an additional check when laying out the mosaic and helps to make the finished product conform to the control network.

Twenty Years of Transportation

IT IS interesting to note that during the last twenty years there has been but little change in the maximum speeds developed by pure physical effort, but in the case of mechanical means of transportation speeds have greatly increased. Man can run now just about as fast as he could twenty years ago, and track records for race horses have shown but little change during that period. Railroad trains likewise have not greatly increased their speeds over records set early in the century, but automobiles have doubled their top speeds, and the airplane today flies seven times as fast as the one in which Glenn Curtiss won the Gordon Bennett race in 1909.

Modernistic Bedroom



Dimensions and completed view of the dressing table, with its bench and chest of drawers, are given in the drawing above. The simplicity of the square-line design makes for easy construction.

FURNITURE

Dressing table, bench, chest of drawers, and a seat-bootery are described in this interesting article, with full directions for building them in the modern mode.

THE keynote in modernistic furniture is struck by taking a lot of odd-size boxes and piling them together. That produces a bookshelf, a whatnot, or most anything else you may want. That being the basic effect, it makes the result easy to achieve in the most complicated of well designed pieces.

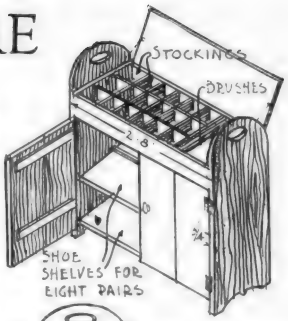
The dressing table shown, for example, looks difficult, at first glance, but when you start analyzing the construction details it becomes a very simple thing—two boxes with hinged doors, held together by a table top, with a mirror at the back. The section at "D-D" shows how two cleats are screwed to the box sides and the table top attached to them.

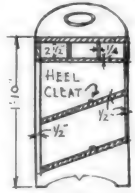
The two sides are built like trunks, 2′ 8″ high overall, 1′ 6″ wide, and 1′ 3″ deep. The doors are three inches deep, giving a pocket on the inside for shoes, and compartments above the pockets for other accessories. The door has a raised center panel, as shown.

The inside arrangement can be varied to suit the individual taste, but the indicated equipment of one drawer at the top with shelves below is very good. The drawer is divided into a number of compartments for various dress accessories.

Inch or three-quarter-inch lumber, either pine, poplar, cypress, maple or oak may be used. Maple or oak can be finished in natural colors, and the others painted or lacquered. The table top is two feet wide by one foot deep, supported, as shown, on cleats screwed to the side pieces.

The section at "C-C" shows the construction details of the mirror and the manner in which it is attached to the cabinets. The wing mirrors are backed with figured veneer—either bird's eye maple or walnut can be used; the walnut being best if the rest of the dressing table is to be lacquered, and the maple preferable if the table is built either of maple or oak and finished in natural color.





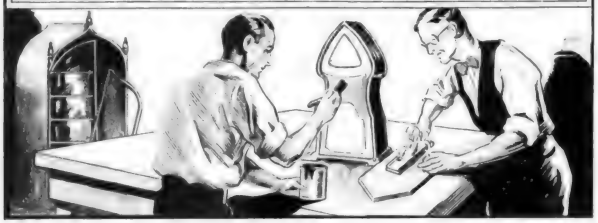
This seat-bootery is portable and contains spaces for stockings, shoes, brush and polish. Note the heel-cleat for holding the shoes on the shelf.

The bench shown with the table is easy to construct, consisting as it does of a plain top and two legs, with braces at either end and a curved sheet of thin plywood to form pockets for soiled towels, hose, etc. The top should be one foot wide and just under two feet long, so it will slip between the sides beneath the table top and be out of the way.

An alternative bench and bootery combined can be built, if desired. The top, as pictured, lifts up, exposing small square compartments, each large enough to hold a pair of rolled-up hose, and with space at the end for brushes and polish.

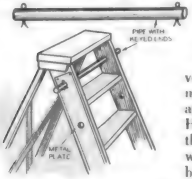
The lower part, fitted with doors, contains two sloping shelves to hold several pairs of shoes. The shelves are fitted with cleats for the heels near the high edge, the toes pointing downward to the front. Dimensions and construction details are clearly shown. Half-inch lumber is heavy enough for the main members, with plywood for the partitions in the top. Built in this manner the seat-bootery is light enough to carry around, but still sturdy and strong.

HANDIKINKS



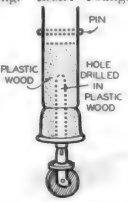
Read these pages of handikinks carefully—you are sure to make use of one or more of the ideas presented here every month, showing short-cuts in performing everyday tasks around the house and in the home workshop.

Pipe Crosspiece Enables Scaffold on Stepladder to be Adjusted Easily

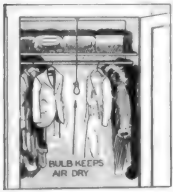


PAPERHANGERS and others who use stepladders for scaffold supports often find a need for an intermediate adjustment between the steps of the ladder which will permit the scaffold to be arranged at a height convenient to the ceiling, so that working conditions will be most comfortable. Any stepladder can be fitted with such an adjustable feature as shown in the drawing at the left. Holes are bored in the side of the ladder midway between the steps and a length of metal piping inserted, the ends of which are held in place with cotter keys. Metal plates can be mounted along the sides for reinforcing.—Lester Young.

Plastic Wood Facilitates Caster Repairs on Metal Beds



IN REPLACING casters on metal beds it is sometimes hard to secure the right size. In such an event an ordinary cabinet caster can be used. A wooden washer of the same diameter as the bed post is then driven in against the pin, as shown in the drawing, to serve as a backstop for the plastic wood with which the remaining space is filled. When the plastic filler has hardened, a hole of the correct size for mounting the caster shell is drilled and the caster mounted in the usual way.—Nina Bye.



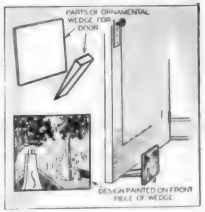
Bulb Keeps Clothes Dry

DURING rainy seasons of the year when the air becomes excessively damp, clothing stored away in closets is likely to become mildewed or otherwise deteriorated in the humid atmosphere. A simple way to keep clothes dry and in good condition during damp weather is illustrated in the drawing at the left. Hang the clothes in a closet which can be made practically airtight, and run an electric wire in if there is not already a connection. Turn on a medium size electric bulb and leave it burning, the door, of course, being tightly closed. The heat from the light will keep the air fairly dry.—Gene Deckert.

Helpful Hints for the Home

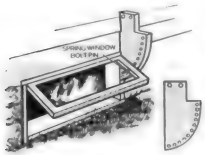
Neat, Ornamental Wedge Keeps Door Open

IN EVERY home there is usually one door which is supposed to be kept open. Here is a device, as shown at the right, which not only keeps it open, but which serves an ornamental purpose as well. An ordinary wooden wedge about six inches long and two inches high is made, and to its large end is nailed a piece of wood about six inches square by a quarter of an inch thick, as shown. The whole can then be painted in some color combination harmonious to the room, or a picture drawn on the square board.—Henry E. Gray.



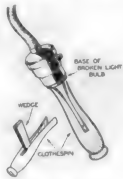
Basement Window Adjustable to Any Angle

A QUARTER circle of wood, cut as shown in the drawing, makes a convenient method of adjusting the window at any angle. An ordinary spring window bolt pin is placed in the window, and when fitted into the various holes in the curved wooden segment serves to hold the window in the desired position.—Walter C. Sehm.



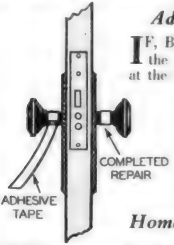
Removing Broken Bulbs

SOMETIMES the cement in the base of a light bulb is defective, with the result that the bulb may be twisted off, leaving the base in the socket. An ordinary clothespin can be used in an emergency of this kind, as shown in the drawing at the right. If the aperture in the base is small the prongs of the clothespin will have to be compressed slightly; when released they press against the sides of the base shell. When the base is so large that the clothespin prongs do not exert sufficient pressure, they may be expanded by inserting a tapered wedge in the pin as shown.—Culver Olds.



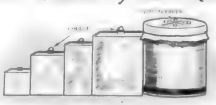
Adhesive Tape Temporarily Repairs Door Knobs

IF, BY reason of stripped or worn threads, the little screw holding the parts of a door knob together drops out and it is impossible at the moment to effect a permanent repair, a temporary remedy can be effected by placing the damaged screw back in place and then holding it there with a couple of turns of three-quarter-inch wide adhesive tape of the type which is found in all home medical cabinets. The drawing at the left gives a good idea of the simplicity of the repair. Friction tape of the kind used in making electrical repairs will also be satisfactory in binding the broken knob together.—Claude H. Cook.

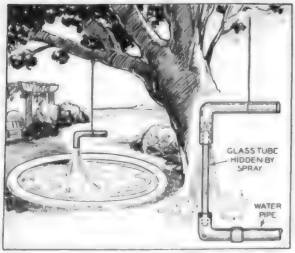


Home-made Mousetrap Catches Rodents by the Dozen

THE mousetrap shown at the right will catch and drown a whole family of mice at a single setting. A jar is half filled with water and a piece of strong brown paper stretched across the mouth and tied in place. Cross slits are then cut in the paper and cheese sprinkled as bait.—Ray Champion.



For the Garden Enthusiast

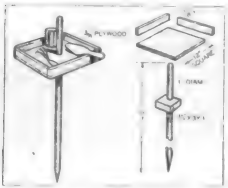


Mysterious Garden Fountain

A GARDEN novelty which will delight and mystify the children and give pause to grownups is easily constructed of two water-pipe elbows and a glass tube. One elbow is fastened to an underground water pipe and a glass tube cemented into it in an upright position, as shown in the drawing at the left. The top end of the tube is then inserted into another elbow which is suspended in mid-air by a cord. Thus, forced up through the tube and down over its sides, making the tube itself invisible to the observer, the water virtually appears to be coming from nowhere. —E. J. Neumann.

Notched Prop Holds Hose in Place for Spraying

TWO boards arranged as shown in the drawing at the right make a handy prop for the hose when spraying the garden or lawn. A V-shaped notch is cut in the board in which the hose rests, and the flange around the nozzle holds it securely in place. The angle of the hose is easily adjusted by changing the position of the boards.—L. B. Christison.

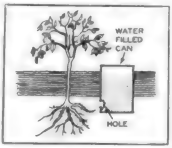


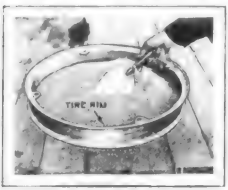
Convenient Stand for Tools in the Garden

THE handy stand for garden tools shown at the left can be pushed into soft soil where you are working and eliminates stooping. A broomstick, a piece of plywood or soft pine a foot square, and four smaller pieces for the sides are all that is needed, in addition to the block to which the bottom is nailed as shown. —Hi Sibley.

Irrigating With Cans

HERE is an easy and effective way of starting plants in dry weather, as illustrated at the right. An ordinary tomato can with an eighth-inch hole a half-inch from its bottom is sunk in the ground near the roots of the plant and filled with water. Tamp the dirt around can and plant and keep the can filled until the plant is out of danger.—Russell Kutz.





Tire Rim Mixing Box

FOR those odd small patching jobs where a bit of concrete is needed to fix up the garden wall or for similar purposes, a regular mixing box is usually out of the question and a pail is difficult to clean after use. Very likely there is an old tire rim lying around the home garage which can be pressed into service as shown in the photo at the left. The rim is laid on a solid base and the concrete mixed inside it. When through, the rim can easily be cleaned by simply tapping its edges.—Frank Bentley, Jr.

Stunts for the Camper

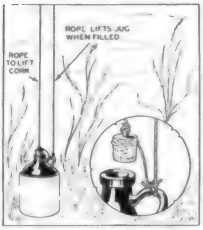
Camera Tripod Supports Gas Camp Lantern

NEARLY every motor camper nowadays carries a gasoline camp lantern. Likewise, nearly every camper carries a camera, and some sort of tripod.

Around camp it isn't always easy to find a place to hang the camp lantern to get the desired illumination, but with the lantern on a tripod the camper is wholly independent concerning the position in which he prefers to have the light.

The writer learned this from experience, and the problem was solved by soldering a nut to the base of the camp lantern—a nut with an inside thread to take the screw in the head of the tripod. With this arrangement I have my light where I want it. I merely extend the tripod, fasten the camp lantern onto it, and set the tripod wherever I need the light.—John Edwin Hogg.

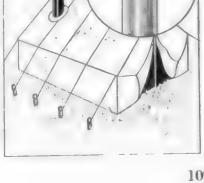
Camper's Trick for Securing Cool Water Supply From the Lake Bottom



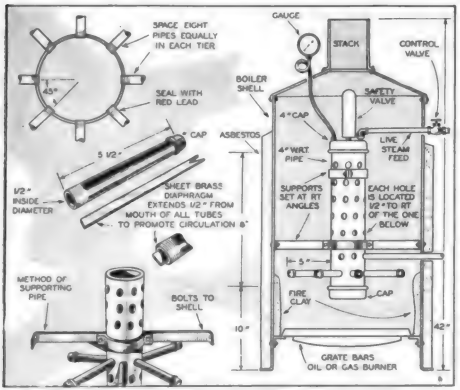
SPRINGS of lakes and rivers can be tapped below the surface of the water by rigging up a jug in the manner shown in the drawing at the left. An eye-screw is fixed in the cork and a fishline or heavy cord attached. The cork is pushed tightly into the neck of the bottle and a lifting cord tied to the handle of the jug for bringing it back to the surface when filled. A weight will have to be fastened to the empty jug in order to lower it through the water. When the desired depth is reached the cord controlling the cork is jerked out and the jug fills with water. If the jug is small, a short cord holding the cork to the handle will be sufficient to lift it to the surface.—William Swanberg.

Safeguarding the Camper's Tent Against Fire

SPARKS may be prevented from flying from the chimney of a wall-tent stove by punching a circle of holes, a little smaller than the average sized nail, around the chimney about six inches from its top. The circle inset in the drawing at the right shows the proper position for punching these holes. Their effect is to create a counter-draft in the chimney which will not permit any sparks from the fire below to rise past the ring of holes. Thus the danger of the top of the tent's being ignited by flying sparks is eliminated. This little trick is well worth remembering, since some day it may save you from losing tent and supplies and equipment.—Walter Sehm.



A "Porcupine" Boiler



Economy of fuel consumption and a high factor of safety are features of the unusual "porcupine" boiler diagrammed at the left, so named because of the short tubes bristling radially from a central core. The drawings show how simple the design is and really tell the whole story of how to construct the boiler. The boiler is shown fitted inside a sheet metal boiler shell insulated with asbestos on the outside. Coal or wood is the simplest source of heat for the boiler, although a gas burner can be installed without a great deal of difficulty.

A HIGH school boy constructed this very efficient little boiler for a home-made steam engine, and it can easily be duplicated. The name is suggestive of its design—simply 56 short tubes extending radially from a central core. The latter is made from a 19-inch section of 4-inch heavy duty wrought iron pipe. Seven tiers of eight holes each are drilled in it, the tiers being 2 inches apart on centers. This leaves about four inches for the steam dome. Each end of the large pipe is capped, the top being drilled and tapped for steam gauge, safety valve and live steam feed pipe. The tubes are also wrought iron, ½ inch inside diameter and 5½ inches long.

A sheet brass diaphragm is inserted into each tube to promote circulation of water. The diaphragm has a V-notch at the blind end and the other end extends half an inch beyond the boiler end of the tube. The tubes are threaded and screwed into the boiler after red lead has been applied at the joints.

The "porcupine" is supported in the boiler shell by means of cross bars, made as shown in the drawing, and set at right angles to each other. Of course, a heavy-gauge sheet metal boiler shell insulated with asbestos on the outside and fire clay in the fire box makes a neat job, with a stack, but for experimental purposes the boiler can be supported inside a temporary fire-brick furnace. The simplest heating arrangement is with grate bars and coal or wood.

It is always safest to test a new boiler under cold water pressure, but lacking the means to do this, one should run no great risk up to 75 lbs.

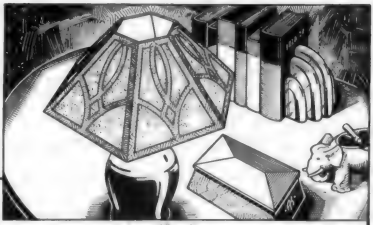
Handy Holders for Shop Scraps Made of Metal

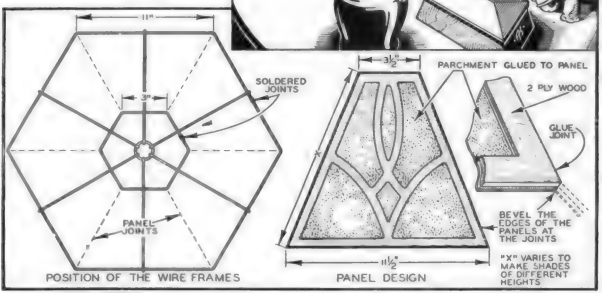
EVERY workshop has an accumulation of small metal parts which are usually scattered over the workbenches or thrown into a corner where they are sorted with difficulty when needed. A handy set of trays can be constructed along the wall as shown in the drawing at the right.

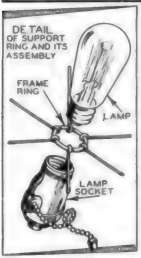
A Silhouette Lamp Shade

THIS interesting shade is made from 2-ply wood, parchment or translucent paper and wire. For tools and materials you will require a pair of pliers, a sharp knife or small plane, scroll or coping saw, glue and solder.

First trace the outline of the design on a sheet of paper, making the measurements just as shown. When one side has been made, it is used as a pattern for the other 5 sides. A small plane is best for beveling the adjoining edges. Remove enough of the wood to enable the sections to fit together snugly when set together. Cut the parchment, cloth or turpentined paper to the side of the panels, then glue this to the inside surfaces, making sure that it adheres at all points.







The drawing gives complete details for constructing the silhouette lamp shade and shows how the scrolled out wood design is cut and used as a framework to which the translucent parchment paper is glued. Note how the supporting wire framework is made, as shown above. At the left is a detail of the wire ring support which holds the bulb and socket in place.

Make a small wire ring just large enough to fit over the threaded end of the light bulb, and solder the ends together. Take a longer piece of the wire and carefully make 6 bends as shown, each bend being 11 inches long. Solder these two ends together. Then make a second ring with each side 3 inches long of the same shape as the larger one. Use no more solder than is necessary. Six pieces of straight wire of the right length are used to connect the small round ring with the larger, six sided ring in the manner shown.

To complete the assembly, apply glue liberally to the beveled edges of the panels, then set them together in place and insert the 6-sided rings, one at the bottom and the other at the top, on the inside and hold in place with narrow strips of heavy paper which have been covered with glue on one side.

After a 24-hour drying period, sandpaper and dust off, then lacquer or otherwise finish to suit your taste.

Golf Device Guides Strokes on Short Shots

Richard Leishman, Chicago pro, demonstrating the short game tutor that automatically sets the arc for all putts, chip shots and approaches.

BOTH the dub and experts will find the new short game tutor a worthy addition to their golfing paraphernalia. It automatically sets the proper arc of the stroke for all putts, chip shots and short approaches. The guide clamped on the club prevents any deviation from the proper line and holds the swing true to the objective.

The short game tutor is the invention of P. N. Vaille of Chicago. It is being demonstrated by Richard Leishman, shown at left.

Spiked Plate for Shoes Aids Sport

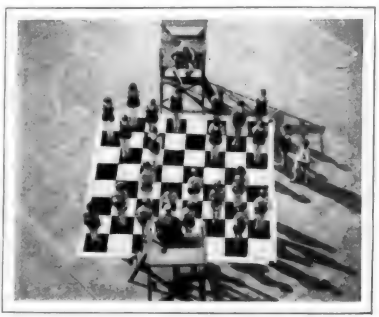
SPORT lovers who frequently find need for spiked shoes can easily satisfy that need by taking an old pair of shoes and applying the comparatively new spiked plate shown here. It clamps to the shoe and is held in place by a number of strong springs. It is ideal for golfers and baseball players. It is quickly detached, light weight and non-rusting. The plate can likewise be used in winter for slippery sidewalks and ice games.

Mammoth Board and Human Checkers Used in Beach Exhibition Game

HUMAN checkers and a giant linoleum checkerboard were used by two Portland, Ore., enthusiasts in a series of exhibition games recently. They sat on towering chairs—in fact, they borrowed those used by the life guards—and played the game by tapping the human checkers with a rod and by telling them to which square they should move.

Some idea of the size of the board itself can be gathered by comparing it to the bathing beauties who served as the checker "men" as well as by the players. The blocks are four feet square.

The exhibition games were played in the interests of a local charity drive and aroused considerable enthusiasm.



Bathing beauty checkers help pass an afternoon at the beach.

Former Coach Invents New Starting Device

LAWSON ROBERTSON, head coach of the 1928 U. S. Olympic team has invented a new way of starting sprints. In place of the old method of toeing the mark or using the starting block, Coach Robertson has created a grip-handle attached to a cable which is fastened to a post behind the runner.

In detailing the advantages of his idea, Mr. Robertson stated that it makes for a much quicker getaway because the runner is already in position. He doesn't have to push himself up to position. Likewise, he stated, the runner's balance is thrown forward—an added source of gaining early speed. The illustration shows the three methods of starting races that are now in use and reveals how Coach Robertson's (firing gun) idea compares with the others.

Three sprint starts are shown by Harris Sachs, Lemoine Boyle and Fred Backer. Coach Robertson is firing the gun.

Juice Extractor Has Many Uses

WITH the coming of summer and the demand for cooling drinks, the recently introduced orange, lemon and lime juicer shown here will aid materially in meeting the demand without needless waste of time, or muss. A few turns and the fruit juice is extracted. It takes but a minute to clean and is comprised of a few simple parts to prevent breakage.

Lindbergh Inspired Flash Beacon

ONE of the newest developments in aviation lighting can be traced to Lindbergh. Overhearing "Lindy" say that "flashings made by trolley car poles are noticeable when flying in a dense fog, even though other lights are not distinguishable," Dr. Irving Langmuir set about experimenting to produce such a flash and one is now in operation at the Schenectady airport.

Rubber Clubs Add Zest to Golf

A NEW type of rubber driver holds the interest of Harvey Firestone, Sr., rubber magnate, shown here with James Thomson, of New York, at Ormond Beach, Fla. This is the type of club which Mr. Firestone is using in his play against the elder John D. Rockefeller. The head of the driver is faced with wood over lead filling.

Harvey Firestone, Sr., examines new rubber club.

Edited by L. B. ROBBINS

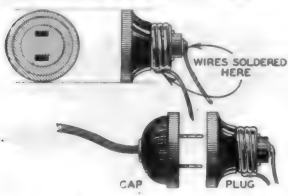
For several years Mr. Robbins has operated amateur radio station W1AFQ. He is a nationally known contributor to radio and technical magazines, and in this department of Modern Mechanics he presents every month plans and kinks which will enable the radio owner to get best service from his set.

Power Plug and Jack Made From Ten-Cent Store Parts

THE most common things can often be used to great advantage by the radio fan. Look at the power plug and jack in the sketch. It was made entirely from electric light equipment without alteration and the whole job only cost a dime.

The jack consists of an attachment plug that screws into any electric light socket. This can be mounted in any convenient position as desired. Then a wire is soldered to the tip and another wire soldered to the metal shell.

The plug is no more nor less than a cap found on the end of every fixture or lamp cord. This is attached to the apparatus or power source in the usual way with a double cord. By plugging the cap into the plug the circuit is completed and when it is pulled out no power flows. This idea can be used for headphones, speakers, etc., just as can any type of single circuit radio jack. Simple, isn't it?



Made out of parts which can be purchased at the ten-cent store, this power plug and jack can be easily assembled as a useful radio accessory.

A Substitute for Battery Clips

HERE is a new wrinkle in connecting the radio to the "A" battery. The usual connection is through the use of battery terminal clips. This method, as a general rule, serves the purpose but corrosion sometimes causes the springs to lose their tension. The answer—hum and static!

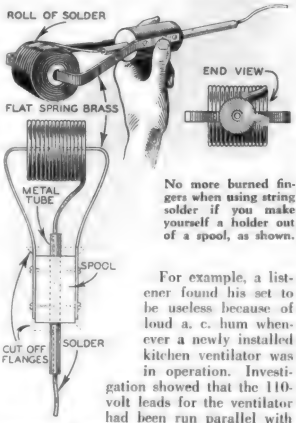
A simple and very efficient connection is easily made through the use of a half-inch screw and a nickle-plated washer. By first drilling a hole slightly smaller than the screw into the battery terminal the screw and washer can readily be set into the lead. The connection to the set is made between the washer and erminal before the screw is tightened.

It will be found that the connection will be tighter than with the spring-clamp and that the surface presented to corrosive elements is materially reduced. Battery noises are virtually eliminated.—F. O. Schubert.

String Solder Holder Insures Cool Fingers for the User

WHEN one has a batch of soldering to do and uses string solder, the latter often gets too hot to hold comfortably. The little tool illustrated in the sketch shows what the writer made to hold string solder, and at the same time give a hand hold on it when working that prevented any heating or burning of the fingers.

Saw off the flanged ends of an ordinary thread spool. Then find a piece of brass or copper tubing three or four inches long that will make a driving fit in the hole in the spool. Fit it so one end projects out farther than the other. The solder coil holder consists of two pieces of flat spring brass fastened to opposite sides of the spool with small screws. Then bend the ends of the strips at right angles. When these are spread apart the coil may be inserted between them and when they close they act as an axle about which the coil revolves. Thread one end of the solder through the tube as shown. Hold the thing by the spool when soldering and note what a relief it is in protecting the fingers from the hot string of solder.



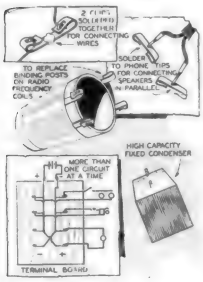
No more burned fingers when using string solder if you make yourself a holder out of a spool, as shown.

Indoor Inductive Interference

MOST radio fans are familiar with the necessity of keeping an aerial at right angles with power wires carrying alternating current. They know that if the two are parallel the result will be a distressing hum in the loudspeaker. But it is not so generally understood that much the same trouble can be caused if the lead-in or ground parallels lighting circuits indoors.

For example, a listener found his set to be useless because of loud a. c. hum whenever a newly installed kitchen ventilator was in operation. Investigation showed that the 110-volt leads for the ventilator had been run parallel with the aerial lead-in and ground where the latter wires crossed the cellar, thereby supplying excellent conditions for induction whenever current was flowing in the ventilator circuit.

Similar conditions will generally be found to blame in cases where inductive hum cannot be traced to the aerial itself. A little investigation in this respect pays big dividends.



Fahnestock Clips Useful to Experimenters

FAHNESTOCK clips obtained from discarded radio B batteries are very useful to the electrical experimenter or the radio builder. The drawing at the left shows a few ways in which these clips can be used. Wires can be connected together without soldering by inserting their ends in the openings in the clips as shown in the drawing. Two pairs of clips, soldered together, can be soldered to a pair of phone tips to allow speakers or phones to be connected in parallel using a single phone plug. Used in place of binding posts on radio coils, the experimenter may change from one type of coil to another easily and quickly. Solder the clips to the terminal lugs of a high capacity fixed condenser and screw them on the terminals of knife switches. A terminal board for the electrical experimenter can also be easily made using these clips. Numerous other uses will suggest themselves.—Joseph Honnors.

A Home-Made Microphone for the Transmitting Station

A view of the completed home-made microphone. Note the gauze covering and the station call-letter at the top, that of Mr. Robbins' station.

THE transmitting amateur may have need for a microphone for voice transmission without feeling equal to buying one. If he can spend a few cents for one of those little transmitter buttons that can be purchased from almost any radio supply house he can make a pretty good "mike" with the addition of the moulded case from an old variometer.

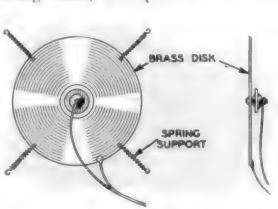
The case shown in the photograph was one that was made in two sections. The wire was removed, the rotor taken out and the case disassembled. Any similar case can be used in a similar manner. At top and bottom were clamps. One was bent down so it formed feet which were then fastened to a circular base piece as a standard. A bolt was run through the top clamp with a nut surmounting it and in which was then soldered a disk of metal bearing the station's call letters.

The speech unit was made as indicated in detail. It consisted of a 3-in disk of thin but stiff sheet brass with a hole in the exact center and four equidistant holes around the rim. In the center hole was secured the solid end of the transmitter button. Previous to this, however, the button was taken carefully apart and a few of the carbon granules removed to make the button extra sensitive. The proper amount can be determined only by experiment. If the grains are too tightly packed speech will be weak, and if too few grains are left the speech will be loud, rattle and appear distorted. In each of the four holes around the rim fasten a little spiral spring or a piece of light rubber band. Then solder the end of a very light and flexible wire to the edge of the disk and to the clip under the tightening nut on the diaphragm end of the button.

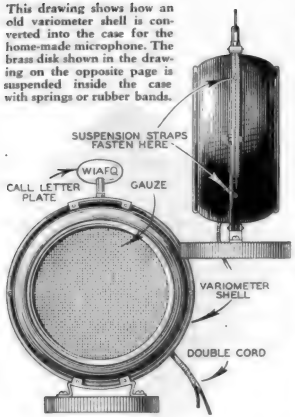
Place the disk in the variometer case and hang it in the center, free from all obstructions, by means of the four springs or rubbers, bringing each one out through a small hole in the seam where the halves of the case join. Then, allowing some slack inside the case, so to bring no pull or strain on the disk, lead the wires out through a hole in the bottom of the case to join the strands of a flexible cord leading to the microphone circuit of the transmitter.

As a last measure, close each side of the case with a piece of silk gauze. This can be done by gluing to the inside or by sewing to a spring wire ring that can be snapped inside the opening. Such a finish will make the mike appear like a studio type and add to its appearance. With proper preparation of the button such a mike will make a nice "single button" type for amateur transmission and make a nice appearance.

A microphone made after this design has given good service in the writer's transmitting station, W1AFQ.



A front and side view of the brass microphone disk, showing the attachment of the transmitter button and the spring or rubber band supports.



This drawing shows how an old variometer shell is converted into the case for the home-made microphone. The brass disk shown in the drawing on the opposite page is suspended inside the case with springs or rubber bands.

Telephone Line to Boat

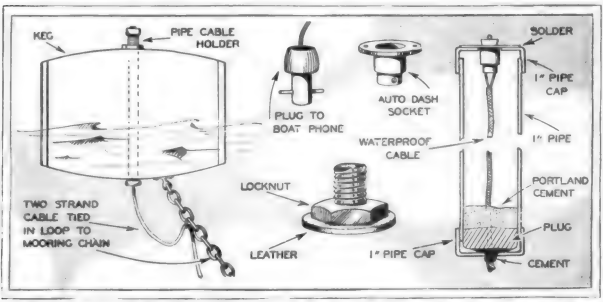
A BUSINESS man who made his summer home on board his houseboat most of the season devised the method shown below for connecting a telephone line from the boat to his shore estate.

The mooring float consisted of a keg. Two 1⅜ in. holes were drilled in opposite sides of the keg through the exact middle and a length of 1 in. galvanized pipe inserted. This was clamped to the keg at each end by means of lock-nuts under which were leather washers.

Each end of the pipe was threaded for about 3 in. A sufficient length of 2-strand, waterproof electric cable was purchased to reach from the house to the mooring keg. A sufficient length of the cable was run through a heavy cork plug which was then driven into the bottom end of the pipe. Then a pipe cap containing a hole for the cable was threaded on with white lead in the joint. This hole was later filled with asphaltum roofing cement and a small portion of Portland Cement was poured down the pipe on the inner end of the plug.

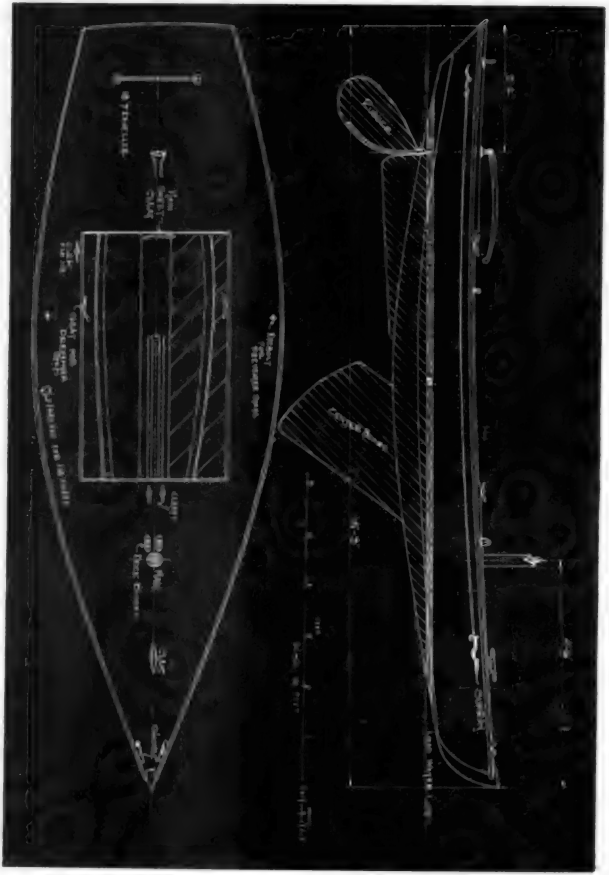
The two strands of the cable should then be connected to a common auto dash socket. Drill a hole to receive the socket in the top of a second pipe cap and drill and tap two small holes in each side by which the socket may be screwed to the cap. Set the socket in the cap loosely, then thread the cap in place with white lead. Then screw the socket in position and lastly, scrape the metal clean around the edge of the socket and sweat solder entirely around it. This makes a water tight joint at the top end. By inserting a cork into the top opening of the socket rain water or spray is prevented from coming in contact with the socket contacts.

In use, the owner could plug in his home from the boat by removing the cork from the top of the pipe in inserting the regulation type auto headlight plug which was connected to the boat phone by a long lead overside.



Details of a telephone connection running from the shore to a moored boat are presented above.

Outboard Profile and Deck Plan Below Give Many Measurements



Mast placing and deck hardware as well as diagonal bottom planking are shown in this blueprint.

HOW to BUILD the 15-FOOT SLOOP "Sunray"

By SAM RABL

Baltimore Naval Architect

Seldom do we have the opportunity to publish the plans of a boat by a famous designer and in such complete detail as are given for Mr. Rabl's "Sunray." This sloop, fast, seaworthy and extremely easy to build, represents the last word in construction economy.

IF WE search the filing cabinet of our memory there is not one of us that cannot some time or other recall building a boat. It may have been the conventional shingle with its end sharpened off, it may have been a bar of Ivory with a paper sail and navigated in the bath tub, but at any rate in the construction of the little racing craft described in the following paragraphs there isn't any path that we have not trod before, and if we have any knowledge of the use of tools at all the simple construction should not offer any difficulties.

Speaking of tools, the ordinary woodworking tools in the possession of every man will suffice for the job. The point that they should be sharp cannot be stressed too much. Dull tools are an abomination and in the end will steal from the job more than ten times the time that it would take to sharpen them. The cardinal woodworking tools—saw, hammer, chisel and plane—are the minimum that are necessary but in addition to these, a drawknife, a sharp hatchet, a spoke shave, and a miter saw will come in mighty handy. In the finishing a nail punch and cabinet scraper will lend the professional touch to the job that is so evident in all yacht work.

Accuracy is another point that should be given attention and even though it may take a little time more to accurately measure and fit a piece, in the end it will look far better than a wooden filler or a putty "dutchman." Material should be cut in strict accordance with the plans with all straight edges true and all edges that are to be square made so by the use of a try-square. In shaping all pieces the lines should be laid out on the wood fairly heavy and with a soft pencil and

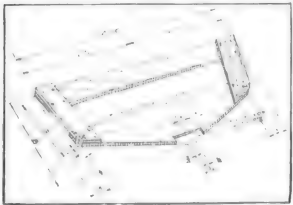


Fig. 1. Showing full dimensions of midship mold.

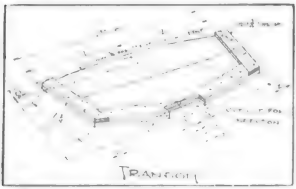


Fig. 2. Dimensions of transom and cleats.

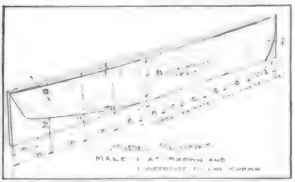


Fig. 3. Cut side planks to dimensions shown here.

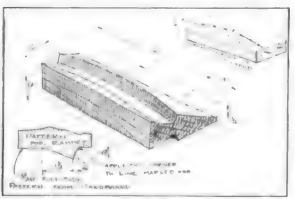


Fig. 4. Stem cutting process with dimensions.

when they are cut the material should be cut to the outer edge of the line, or in the parlance of carpentry "leave the line stand."

Let us suppose that we are about to purchase the material. In the bill of material we will find listed all the material necessary to complete the hull and spars of our little craft. We will find that in the columns specifying the kind of material there are some woods that are marked with a cross and some with a circle. The wood that is cross-marked is the kind that is most suitable for the particular piece designated; it is the kind of wood that long years of experience have shown to be the best for that part for which it is intended. The circle-marked woods are those that may also be used if the first selected is too expensive to suit the builder's purse or cannot be obtained in the builder's local lumber yard. And speaking of lumber yards there isn't (with the exception of the mast) a single piece that cannot be obtained in the neighborhood lumber yard. All of the wood should be selected either by yourself or someone who is a competent judge of lumber to be sure that all pieces are as reasonably free from knots and other defects as first grade lumber should be.

After the lumber arrives and your fingers begin to itch to handle a saw, it might be well to try your hand in making the mould. This particular part, Fig. 1, can be made of any cull lumber available as it is not to be a permanent part of the little ship and is only a form to give shape to the body of the hull. After the notches are cut for the chines and keelson the mould is complete.

The transom, Fig. 2, a permanent piece of the boat, is next made in the same manner that the mould was manufactured with the exception that it is a solid member and it might be well to dowel the two boards that it is made from, together.

The side planks, Fig. 3, are next made from two sixteen-foot boards as shown on plan one, by first squaring lines at eighteen inch intervals across its surface and measuring the various points of the curve of the bottom at these points. A slight curve is shown to the top of the planks to lend a pleasing appearance to the sheer of the boat. After one of the side planks is made by sawing it to shape or trimming away the excess wood with a drawknife, it may be used as a pattern for the opposite plank. In any event the planks should be laid to-

gether to check their sameness.

The stem, Fig. 4, is next made from a piece of three by six inch oak 19 inches long and a curved line is laid out on both sides of it from a pattern taken from the forward end of the side planks. A full size cardboard pattern, Fig. 5, is made as shown on the plan and a rabbet is chiseled in both sides of the piece as shown on figure one

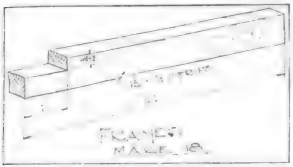


Fig. 9. The frames of oak are eighteen in number cut to the dimensions given. The notches are for the chine piece.

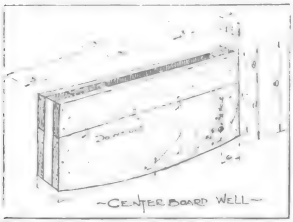


Fig. 7. The centerboard well or trunk is put together in the above manner. The bottom is slightly curved to fit the spring in the keelson.

to fit this pattern. From the outer edge of the rabbet the stem is tapered to a thickness of three-eighths-inch on its forward edge but the round-up is not cut on this edge until the bottom planking is fitted so that this round-up may fit the bottom.

The keelson, Fig. 6, is the next step in the construction and there is no difficult operation in its makeup. A mortise three inches wide and three-quarters deep is cut as shown and through this mortise a slot one and one-half inches wide is cut all the way through the keelson. The center board well, Fig. 7, is next made and fastened in the mortise from the under side by three-inch wood screws of brass at about six-inch intervals. The keelson will have to

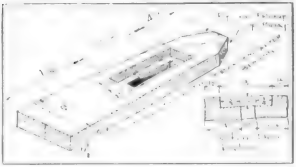


Fig. 6. The keelson will require careful mortising in order to keep the centerboard trunk dry. White lead all seams.

be weighted on each end to make it bend around the centerboard box which has a slight curve to its bottom.

We have now reached the point where the actual assembly of the boat is started. The

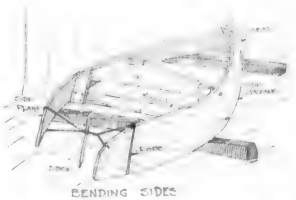


Fig. 8. With the stem cut, the side planks fastened to stem, side planks are bent around mold with a rope clamp.

side planks are fastened to the stem with number twelve brass wood screws, two inches long and spaced about three inches apart. It is best to stagger these fastenings to avoid splitting the stem and a small hole drilled to guide the screw will be a great help. Soap rubbed on the screws will make their entrance easier and in fact this procedure will help in every fastening driven in the boat. About two inches of the stem should be allowed to project below the side

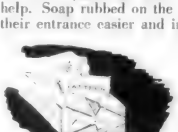


Fig. 5. The stem rabbet is cut with a paper pattern.

Chesapeake Bottom Planking Runs Diagonally

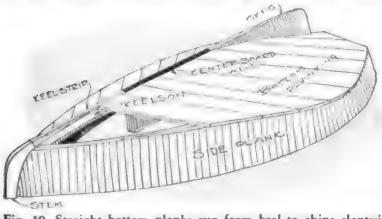


Fig. 10. Straight bottom planks run from keel to chine slantwise.

planks for trimming later. The mould is next fastened inside the side planks at the point marked and nails are driven partly in the mould through the side planks to prevent its slipping.—Fig. 8.

We now reach a point where brawn is needed and the side planks are bent in to fit the transom. To aid this operation a few turns of rope are passed around the side planks close to the end and after muscle fails to move the planks any more a stick is inserted between the ropes and the ropes are wound up until the sides meet the transom. The distance between the ends of the sides and the center of the mould should be watched constantly as the sides are bent in as some boards will have a tendency to bend more than others and if this happens the transom will be thrown off of center. To arrest this movement temporary braces may be nailed from the end of the side that is bending most to the mould on the opposite side. After the sides meet the transom they should be securely fastened with brass screws. The chines are next bent in allowing them to project about a quarter inch outside the bottom of the side planks to allow for trimming later.

The keelson is next fitted to the bow and bent over the mould and fastened to the transom. It is next to impossible to secure a good fit of the keelson inside of the transom and it is suggested that the transom be notched and the keelson run through and cut off flush with the transom after the hull has been planked and is ready for finishing. After the keelson is fitted two parallel lines are drawn down its bottom, one and one-half inches apart and three quarters of an inch each side of the centerline. The side planks, chines and keelson are now beveled off until a straight edge board will exactly touch the outside of the side planks and the lines drawn on the keelson. This newly made surface is the point on which will rest the bottom planking and on which will depend the tightness of the hull. If this surface is incorrectly beveled leaks may result and too great care cannot be taken in its finish. The side frames are now made as

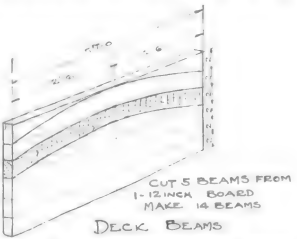


Fig. 11. Cut deck beams from one piece as shown.

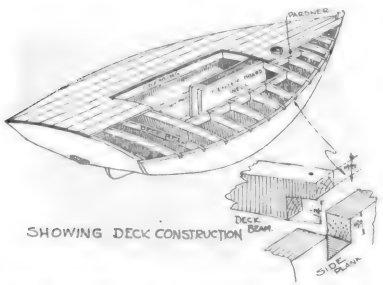


Fig. 12. Beams are mortised; deck planks are laid fore and aft.

shown on Fig. 9 and fastened to the points marked eighteen inches apart on the inside of the side planks. After the bottoms of the frames have been cut off to the proper bevel we are ready to fit the bottom.

Starting somewhere near the mould the six-inch planks are laid diagonally from the keelson aft to the sides and marked off and fitted (Fig. 10). Their inner ends should be squared and their outer edges beveled to fit the slope of the sides. A heavy coat of white lead should be laid under each plank and their edges should be left about a sixteenth of an inch apart to allow for swelling later. They should also be given a coat of paint on their edges to preserve them. The planking is continued aft on both sides to the transom and forward to

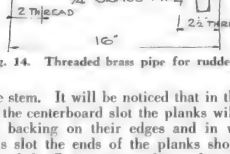


Fig. 14. Threaded brass pipe for rudder stock.

the stem. It will be noticed that in the way of the centerboard slot the planks will have no backing on their edges and in way of this slot the ends of the planks should be rounded off to prevent slivers from working off of their surface. It might be well to slightly round the ends of the bottom planks where they meet the sides for this same reason. In the way of the centerboard slot a piece of old flannel or wool cloth about an inch wide laid under the bottom planks will be good insurance against any leak that might develop at this point later in the life of the boat. After all the planking is finished the nail heads

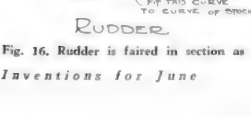


Fig. 16. Rudder is faired in section as shown.

Here Is "Sunray's" Cross Section

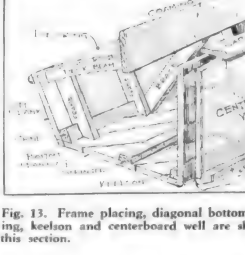


Fig. 13. Frame placing, diagonal bottom planking, keelson and centerboard well are shown in this section.

should be puttied tightly and left to dry.

Starting eight inches from the back of the stem the deck beams are spaced twelve inches apart along the centerline of the boat. The centerline mark on the beams must be kept to a line stretched from the stem to the center of the transom and the excess trimmed from either end. In the way of the centerboard trunk where it is

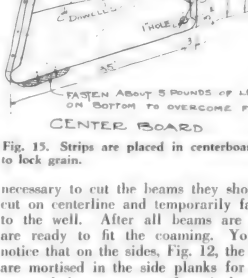


Fig. 15. Strips are placed in centerboard ends to lock grain.

necessary to cut the beams they should be cut on centerline and temporarily fastened to the well. After all beams are in we are ready to fit the coaming. You will notice that on the sides, Fig. 12, the beams are mortised in the side planks for a distance of three quarters of an inch and as there are two ways of fitting a coaming this way is preferable. The other way is to allow the coaming to project above the deck about two inches as shown on the sec-

Center of Effort of Sail Set for Delicate Balance

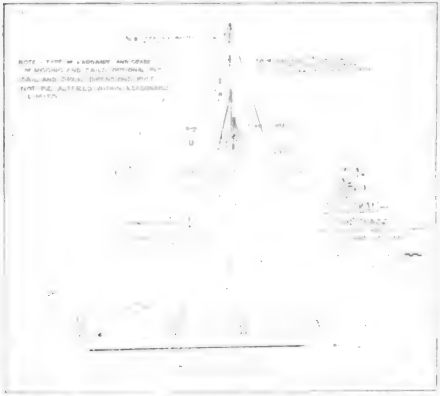


Fig. 20. The designer is generous in stating "sail plan must not be altered within reasonable limits." To assure successful balance and close sailing on all points of the wind you should follow this sail plan exactly.

tion through the boat, Fig. 13, and the beams end nailed. While this raised coaming excludes water from the cockpit it has a nasty habit of cutting the crew under the knees as they sail the craft and on a long stretch becomes pretty tiresome. To cut out the cockpit opening first temporarily nail two strips of wood about ten feet long eighteen inches out from the centerline of the boat on each side. Make sure that these are parallel and then starting with the sixth beam aft of the stem saw out the seventh, eighth, ninth, and tenth beams, along the strips previously nailed down eighteen inches from the centerline. This will give us a cockpit five feet long with the sixth beam as its front and the eleventh beam as its rear ends.

Now from the curve of the under side of the strips that were nailed down to take the ends of the beams mark off the four-inch coaming boards to the sweep of the deck and cut them to this curve, or if you prefer the raised coaming nail them in and round off the tops.

The deck is now in shape for the final touches before it is planked so between the fourth and fifth beam a piece of two-inch by twelve-inch yellow pine is fitted to take the mast. This piece is called a pardner and takes the strain of the tugging spar from the light material of which the deck is made. The top of the pardner is rounded to the curve of the beams and through its center a five and a half inch hole is cut for the mast. The large diameter of the hole allows the mast to be wedged and its rake adjusted. Between the twelfth and thirteenth beams a piece of two by six is fitted to take the rudder stock and between the second and third beams a similar piece is fitted to take the bow cleat. It might be well also to fit small pieces of scrap in the way of the chocks and cleats that occur other places about the deck.

Starting on one side of the cockpit the tongue and grooved ceiling is now laid with its beaded face down and the entire deck

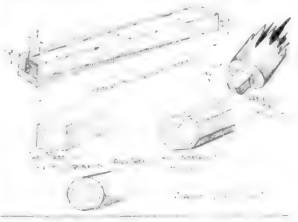
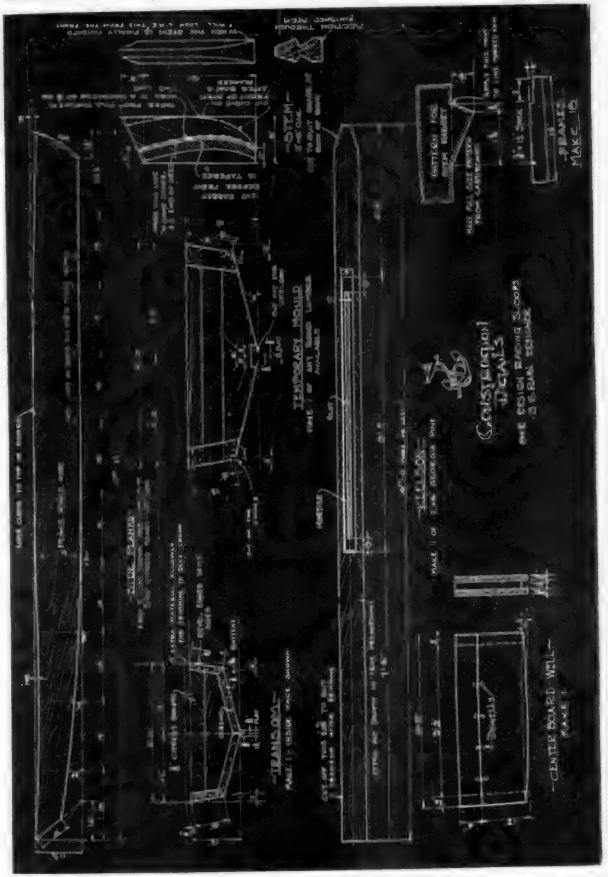


Fig. 17. The spruce pole procurable at any lumber yard is worked into a mast, step by step, as shown in this diagramatic construction plan. Use a big jackplane for cutting the successive tapers. Finish with coarse sandpaper.

Construction Blueprint Shows All Measurements for Major Pieces



The keelson drawing and topside planks are shown to scale. Rabbet pattern details also shown.

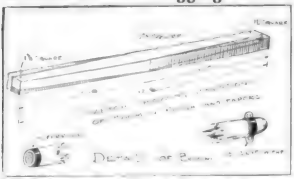
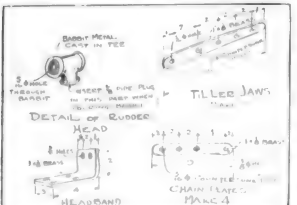


Fig. 18. Even the details of the boom hardware are depicted by Mr. Rabl in this fine article.

is covered. We are now ready to apply the canvas. This should be ten or twelve-ounce material and should be laid in thick paint spread evenly over the deck. The canvas should be tacked at the edges and around the cockpit opening with copper or galvanized tacks. A moulding should be run around the sides and cockpit to cover the edge of the canvas which should be given at least an inch lap around these edges.

A hole one inch in diameter is now drilled through the keel strip aft of the skeg as indicated on the plans and an inch and one-eighth hole drilled through the deck directly above it. A piece of brass pipe of three quarter inch size and fifteen inches long, Fig. 14, is now passed down through the deck and the threaded end screwed into the one-inch hole through the keelson.



Figs. 21, 22, 23. The tiller jaws are made from brass strap stock as are the chain plates and head plates.

The center board, Fig. 15, is now made as per the plan and a three quarter inch hole drilled through the well as indicated. When the board is inserted a three quarter inch oak pin is driven through the well to act as a pivot for the board. The crack between the sides of the well and the keelson should now be puttied after forcing lampwicking or caulking cotton in the seam.

After the rudder, Fig. 16, and tiller is made according to the plans the hull is finished with the exception of the hardware which will be taken up later.

As very few of the small lumber yards carry a four by four inch stick of fir in stock the spar stock may have to be ordered direct from some of the larger yards but will not be at all hard to obtain.

Assuming that the sticks are in our possession and that we are ready to cut them out we will begin by first drawing a three and one-half inch square on one end of the twenty-foot stick, Fig. 17, that is to be our mast. On the other end we will draw a one and three quarter inch square. Lines laid out from a string stretched from the corners of our square will give us our working edges and they should be laid in the wood pretty heavy. After the excess wood has been trimmed down to these lines we will proceed to smooth up the spar again with a smoothing plane until all the humps and hollows have disappeared and the sides of our square spar are perfectly straight and true to square. After this operation is complete we will again lay off the ends into a perfect octagon or eight-sided figure and so on until it is round.

After the spar is roughly rounded with spoke-shave and plane it is "sanded" round by taking coarse sandpaper and rubbing in a rounding motion across the spar. This is best accomplished by straddling the spar and grasping the sandpaper in both hands and see-sawing it across the spar.

The boom, Fig. 18, is gotten out in exactly the same manner with the exception that it has a double taper but in all other respects is the same as the mast. After the sticks are finished and sanded smooth they should be given three or four coats of linseed oil and benzine and after they are thoroughly dry they should in turn be given three coats of good spar varnish.

The rudder stock, Fig. 19, is next manufactured from three-eighths brass pipe as shown on the sketch and four or five three-sixteenths holes are drilled through it to take the screws that fasten it to the rudder. Any local plumber can get out this piece of pipe and the rudder tube if you are not equipped to make these pieces at little cost. The rudder is next made to the dimensions shown and fastened to the

stock with three-inch brass round head wood screws.

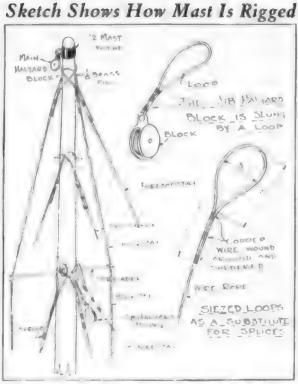
The rudder head, Fig. 20, is a pipe tee that is filled with babbit metal that can be procured at almost any garage and drilled to take the tiller bolt. In filling the tee one side of it opposite to the run is plugged with a standard pipe plug and the tee is buried in sand that must be dry and then filled with the molten babbit. The hole is then drilled through the babbit and the plug removed and the finished product is in turn screwed to the head of the rudder stock.

The tiller jaws, Fig. 21, are made from brass strap stock as are the chain plates, Fig. 22, and the head plates, Fig. 23.

We are now ready for the rigging.

While on large vessels you will find the various stays ending on forged bands on this little craft we have ended them in loops for sake of strength and lightness. All loops are made to the dimensions shown, Fig. 24, and are wrapped with about ten turns of No. 14 copper wire at three points. To any of the thousands who have built their own radio sets this operation will offer no difficulties. The loops should be coated with tallow and canvas or rawhide sewed around them to keep them in trim for it is at these loops that rigging goes first. If you can splice wire rope it is a much neater job to splice in these loops but not a whit stronger. A splice is made in rope by intertwining the strands and there are some excellent works on this subject in almost any public library. In fact speaking of libraries it might be well if you are a novice at the game to devour all the readable matter on the subject of yachting that you can lay your hands on.

Sketch Shows How Mast Is Rigged



Full details of mast-head rigging and splicing.

Running rigging aboard a boat is the ropes that perform the work of hoisting and trimming the sails and in our little course on ropes we will deal with them next. The rope running to the block at the masthead that performs the function of hoisting the big sail which is called the mainsail and pronounced mains'l is termed the main halyard. The term halyard comes down from clippership days and is a contraction of haulyard, a function that it was first called on to perform, haul up the yard or cross

(Continued on page 204)

BILL OF MATERIALS

Member	No. Pcs.	Size	Oak	Y/Pine	Cypress	Spruce	Fir
Keel	1	2x 6 x16 ft.	X	O			
Sides	2	¼x12 x16 ft.		O	X		O
Transom	1	¼x 8 x 6 ft.	X	O	O		
C. B.Trunk	1	¼x12 x 8 ft.	X	O	O		
Ditto	1	¼x 4 x 8 ft.	X	O	O		
Ditto	1	1½x 3 x 4 ft.	X	O			
Stem	1	3x 6 x 2 ft.	X	O			
Frames	2	¼x1½x12 ft.	X	O			
Chines	2	¼x1½x16 ft.	X	O			
Bottom	10	¼x 6 x16 ft.		O	X		O
Beams	1	1½x12 x16 ft.	X	O			
Deck	75 sq. ft.	¾x3 T&G			O	X	O
Coaming	1	¾x 4 x10 ft.	X	O			
Cntr. Bd.	1	¼x12 x 8 ft.	X	O	O		
Rudder	1	¼x12 x 4 ft.	X	O			
Mast	1	4x 4 x20 ft.				X	O
Boom	1	2½x2½x16 ft.				X	O

Add to above miscellaneous cull lumber for moulds and forms; numerous small parts not listed are allowed as scrap in above pieces.

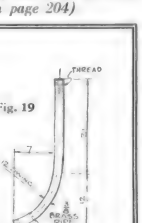


Fig. 19

Spiral Ramp Approach for

The new bridge that will span the Mississippi at New Orleans will cost $3,000,000 less to construct because of unique circular ramp approaches. It will have a 174-foot clearance in the center of the main span above the mean high water level of the river. The ramps occupy 300 square feet and rise 135 feet into the air. The gradient of the ramps—which are 30 feet wide—will be 3½ per cent. The ramps for up and down traffic will be interlaced and may be likened to a right and left hand thread.

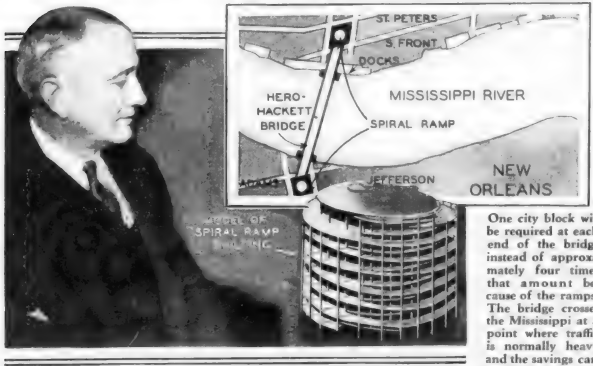
THE War Department has approved plans for the construction of a $12,000,000 vehicular toll bridge over the mighty Mississippi River at New Orleans. Actual construction will start this summer and the engineers estimate that two years will be required to complete the project. The Hero-Hackett Bridge, as it is called, will be the only bridge of its type in the world and while the roadway will be 120 feet above the level of the flat New Orleans streets, no long inclined approaches will be required to reach the bridge. The bridge will terminate at each end in a building occupying a three hundred foot square of ground and rising one hundred and thirty-five feet into the air. These buildings will house two interlaced spiral ramps that will carry one-way streams of traffic to and from the bridge.

The gradient of the ramps will only be three and one-half per cent which gives so mild an incline that any car may easily ascend to the bridge in high gear, and no trouble will be experienced from the brakes during the descent. Each of the roadways will be thirty feet wide, and since the up and the down traffic will move on separate ramps, the maximum number of vehicles may be handled without congestion. These ramps will be interlaced, one within the other, and may be likened to a right and left hand thread. The ramps will start at opposite sides of the building so that cars coming down will not interfere with those going up.

A motorist entering the ramp building from the street will make approximately three and one-half loops of the building in ascending to the bridge proper. Each loop being about 1,000 feet in length, he will have traversed a distance of nearly three-quarters of a mile when he reaches the bridge roadway.

The ramp buildings will be of the usual concrete and steel construction and will rest on foundations similar to those of all the largest New Orleans office buildings. The ground comprising the site of the building will be excavated and clusters of piling driven to the proper depth to provide a foundation, after which the entire area over the piling will be filled with a thick layer of reinforced concrete. Upon this foundation the building will be raised.

River Bridge at New Orleans



One city block will be required at each end of the bridge instead of approximately four times that amount because of the ramps. The bridge crosses the Mississippi at a point where traffic is normally heavy and the savings can readily be seen.

Allen S. Hackett, the designer, for whom—with his partner, Col. George A. Hero—the new bridge was named, is shown examining his sheet iron model of the circular ramps. Elevators will carry pedestrians to the bridge level.

High speed elevators and stairways will be installed in the space within the ramp circles for the use of the pedestrian traffic of the bridge.

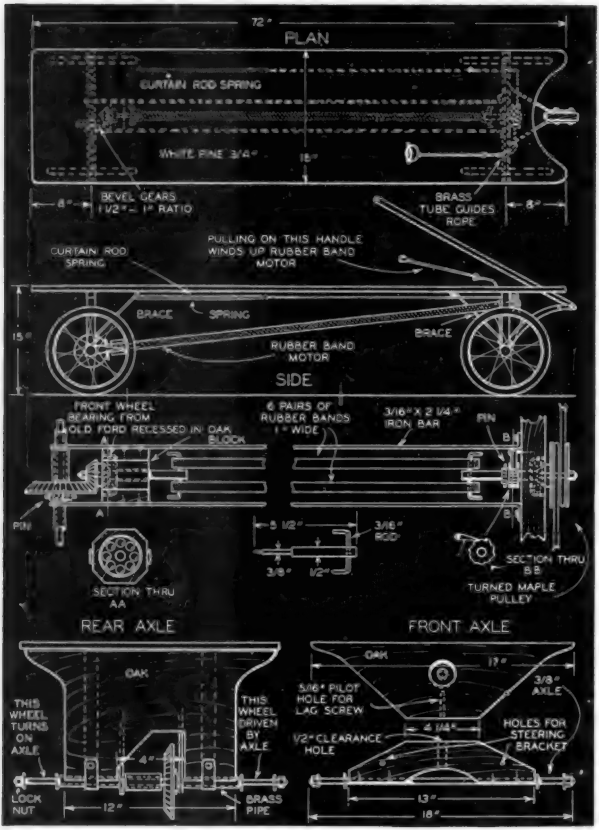
The ramp buildings will serve a dual purpose as in addition to eliminating the long approaches, which would necessitate a large amount of real estate, they will provide a firm anchorage for the bridge structure and cables.

The bridge proper will consist of two 800-foot approach spans reaching from the ramp buildings to enormous bridge piers. These concrete and steel piers will be 125 feet wide and 60 feet thick at the base. They will be imbedded in a stratum of hard packed sand some 200 feet beneath the bed of the Mississippi River. The piers will be built in sections and sunk into the river bed by their own weight and the action of high pressure water jets. When completed these piers will rise 350 feet above the low water level of the river. Between them a single 1760-foot span will be built across the main channel of the Mississippi River, making the total length of the bridge 3360 feet between the two ramp buildings.

In designing the bridge the engineers have borne in mind the immense river traffic which New Orleans enjoys as the second port of the United States. The bridge will have 174 feet clearance in the center of the main span above the mean high water level of the river. This is ample to allow the largest liners to pass under the bridge with ease.

The bridge was designed by the nationally known New Orleans engineer, Allen S. Hackett and takes its name from Mr. Hackett and his partner in the project, Col. George A. Hero, a New Orleans capitalist. The spiral ramp is a distinct departure from the usual type of bridge approach. Its use will permit the construction of high clearance bridges in congested areas where long inclined approaches would require so large an amount of high priced real estate as to make their cost prohibitive. The designers of the Hero-Hackett Bridge estimate they will save the city of New Orleans and the state and national government over $3,000,000 due to their circular ramp approaches.

Blueprint Shows How Car Is Driven by Rubber Bands



This blueprint shows how the rubber strips cut from old inner tubes are hooked up with a ratchet and bevel gear to furnish the motive power for propelling the Flivver-car. A single winding drives the car about 200 yards. The rubber band motor can also be wound while the car is in motion.

Rubber Bands Run this FLIVVER Car

by **DICK COLE**

Using strips cut from old inner tubes as motive power, the Flivver-car described in this article by Mr. Cole can easily be built by any boy and will be an endless source of fun.

HERE is something which will gladden the heart of any boy—a car which goes by itself. The motive power is a rubber band motor. Just as twisted strands of rubber are used to whirl the propeller of a model aeroplane, so heavier strands can be used in a similar manner to provide mechanical locomotion.

Before going into the details of the construction of this car, it is well that the prospective builder should have a clear insight into the principle employed. The blueprint shows the plan and the elevations of a model Flivver-car in its simplest form. This is really a remodeled coaster wagon. With a little ingenuity, any boy can add a rumble seat and an old auto steering wheel and have a classy, rakish looking roadster.

The motor and its operation is clearly shown in the blueprint. It consists of multiple rubber bands cut lengthwise from an old 30" inner tube. The rubber must be live and "springy." Suitable discarded inner tubes can be bought for a few cents a pound at any vulcanizing shop.

The rubber bands are stretched along the center line of the car between the axles. The rear end of the bands is attached to a stub axle on which is a bevel gear. This engages with another bevel gear on the rear wheel axle. One of the rear wheels is rigid on the axle, the other turns freely on the axle. So, when the rubber bands are wound up, the torque is communicated to one of the rear wheels and the car is driven forward.

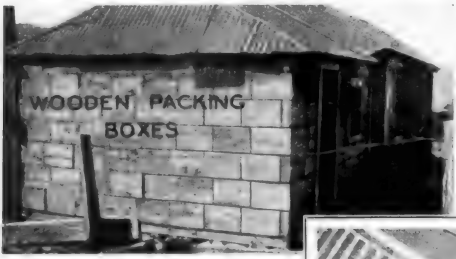
Provision is made for winding up the rubber band motor at the front end. This could be achieved in a number of ways, but the method illustrated is simple and effective. It consists of a grooved wooden pulley—maple preferred—attached rigidly to the front stub axle. A length of light weight sash-cord is passed around the pulley. One end of the sash-cord is led to a long coiled spring on the under side of the top. A spring from an old shade roller is recommended at this point. The other end of the rope is led to a point convenient to the rider. By pulling upon this end, the rope is "snubbed" on the pulley and the pulley is turned, winding up the rubber bands. A ratchet and pawl prevents back-turning. When the rope is released by the operator, the spring pulls it back to get a new grip. This is the same principle as employed on a ship's capstan. This car is capable of traveling 200 yards on one full winding.

It is probable that any boy building this car will use his old coaster wagon for the purpose. Since coaster wagons vary in their construction, it is impossible to give exact dimensions that will convert the coaster wagon into a Flivver-car, so the blueprint is offered to suggest a simple and satisfactory way to make the conversion. The dimensions given are most suitable to a car with 12" wheels.

To apply a rubber band motor, a Flivver-car must be much longer than the usual coaster wagon. It should be at least 56" between center-lines of axles. This means that the top must be about 72" long. A suitable design for the top is shown. Soft wood, white pine particularly, is recommended. The width of the top is 18" but it

(Continued on page 196)

Miner Makes His House Out of Blasting Powder Boxes



ALMOST unusual use made of old boxes is to be seen in this Mexican hut where they have been set together like cement blocks. Note neatness of joinings at the corner. The inside of the house has been finished off with wall board.

This blasting powder box home of a Mexican miner is well protected against the elements.

Joinings have been carefully made. The boxes are nailed together as they are piled on each other. Walls and ceilings are finished with wall board.

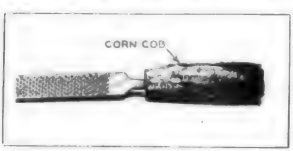
Reconditioning Your Razor Hone

HONES that have become slightly glazed and concave may be repaired by placing fine grinding compound on a level steel or iron surface, and grinding with an oscillating motion until the surface of the stone is perfectly flat.

It will be found that the slight grain left from grinding will greatly facilitate honing. Very little time and effort will be required to remove the rounding edge which a razor gradually acquires from continual stropping.

The grade of grinding compound recommended is that known as "A" mixture.

Dried Out Corn Cobs Make Non-Slip Handles for Many Small Tools



When you need a handle for a file use a cob.

ONE of the best improvised tool handles which can be had is a corn cob. The pithy core of the cob enables it to be slipped over the tang of the file, chisel or other tool without boring a hole, and also does away with cementing the tool into the handle. The rough surface of the cob is rather an asset for it prevents slipping of the tool when in use. Owing to the slow drying of the cob it assures a firmly held handle at all times.

First All-Mexican Airplane Successfully Meets Its Tests

After extensive, extremely rigid tests, Mexico has accepted this first, all-Mexican designed and built plane. The ship is equipped to land on both water and land and has many interesting features.

THE first all-Mexican designed and manufactured plane recently underwent a series of tests and emerged with flying colors. The ship was designed by General Juan F. Azcarara and has been accepted by the Mexican government who hope soon to equip the air section of their army with sister crafts of the same design.

As can be seen from the illustration there are a number of features embodied in this plane. A sesqui-wing is mounted immediately below the motor, slightly ahead of the main wing above the ship. The landing gear is equipped to bring the ship down on land or water. The pontoons are unusually wide but only two wheels are supplied. The nose of the pontoons has been especially padded for protection against hidden reefs in water landings and to prevent damage in the event of forced landings in rock-covered areas.

Although no details have been given out by the Government, it is understood that the ship is capable of 125 m.p.h.

Largest Neon Tubes on Bosch Plane

FLASHING its message every six seconds as it flies through air at night this plane, equipped with the largest neon tubes ever made, will soon take off on a trip about the country. The ship is a Keystone tri-motored job, the largest commercial plane built.

This flying electrical billboard can be plainly seen 6000 feet.

AMATEUR ELECTRICIAN

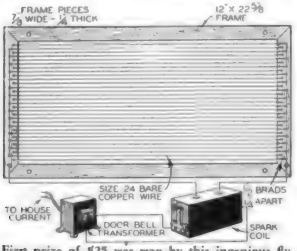
Edited by THEODORE ALLEN

Electricity is a favorite field for the experimenter. Almost everyone enjoys making small pieces of electrical equipment, and in this department of Modern Mechanics, Mr. Allen presents his newest plans every month for projects which the amateur craftsman can easily build up in his home workshop.

Announcing Winners in the Ford Spark Coil Contest

ENTRANTS in the Ford spark coil contest which ended February 1 displayed surprising ingenuity in figuring out new uses to which these units can be put. The surprising number of entries received was very gratifying to the editors, and the uniform excellence of the contributions caused the contest judges to award seventeen honorable mention awards in addition to the prizes announced for the first three winners.

First place, and a check for $25.00, went to Robert Jacobs, 1732 Juneway Terrace, Chicago, Ill., for the ingenious fly killer shown in the drawing. We think you will agree that Mr. Jacobs has discovered an exceedingly novel use for an old spark coil in converting it into an electrocuting device to do away with house flies. There is nothing at all complicated about the device: you can build one easily from the drawing.

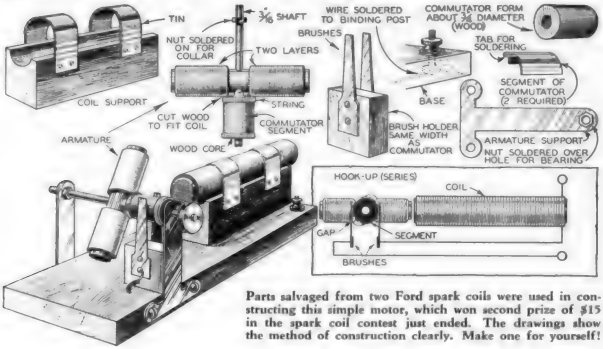


First prize of $25 was won by this ingenious fly killer which electrocutes them when they alight.

About 130 feet of 24 gauge bare copper wire is required, stretched across a wooden framework as shown. The wire brads at each end of the frame are spaced a quarter inch apart. There are two rows of brads on each end of the frame, the inner row being spaced between the outer row so that the wire strands are separated by an eighth inch when completed. A door bell transformer or four dry cells connected in series furnish the power source for the Fly Electric Chair, being connected up with the spark coil as shown in the drawing. Battery clips soldered to buttons on the coil are used to attach the ends of the stretched wire to the spark coil.

When the fly lands on the screen its body crosses the high frequency wires, and presto! it is electrocuted by the high voltage. Mr. Jacobs reports that his little invention has proved very useful about his home.

Spark Coil Parts Used in Making This Electric Motor



Parts salvaged from two Ford spark coils were used in constructing this simple motor, which won second prize of $15 in the spark coil contest just ended. The drawings show the method of construction clearly. Make one for yourself!

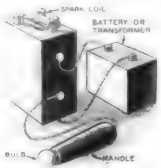
SECOND prize of $15.00 was awarded Lloyd Moore, 403 South 13th Street, Chariton, Iowa, for his motor built from salvaged spark coil parts, as shown in the above drawing. Two discarded Ford coils are required to construct the motor, the parts used being obtained almost entirely from these coils, which need not be in working order, since the parts used in making the motor are seldom burnt out in the coils.

First dismantle both coils, being careful to save all screws, nuts, and small bolts. The primary or center coil of each is what you are after, so take special care not to injure the windings. A motor base eight inches long and four wide is about the right size. Two other pieces of wood will be required, one for a brush holder and one as a coil support, as shown in the drawing.

The armature is a little more difficult to make. After removing the wire, cut off one of the cores and make a rotor about three inches long. Drill a hole through the center for the shaft. Place the rotor on the center of the shaft and then cut the commutator form so it will fit into the two coils just wound on the rotor. These coils must both be wound in the same direction. The commutator is arranged so that when the rotor is making a straight line with the stator the brushes are just passing the division line on the commutator.

The rest is easy. The brushes are adjusted so that they do not press too heavily on the commutator, and yet give good contact. The stationary contact arm on the coil is used as an armature support. It uses a small nut, taken from the coil, soldered on as a bearing. The adjusting nut and bolt make a fine binding post. The vibrators are cut off and made into brushes. String soaked in glue holds the segments on the commutator form.

ERNEST KOBS, Box 86, Algonquin, Ill., won third prize of $10.00 with a violet ray machine, designed to relieve the pain from bruises, stiffness, etc. The parts needed are a spark coil, length of wire, a burnt-out bulb from an auto headlight, and a battery or transformer to furnish the current.



Third prize, $10, was awarded for this violet ray outfit.

Wiring connections are shown in the drawing. The applicator is made from the auto bulb. A piece of wire about five feet long is soldered to the base of the bulb, and a handle formed by drilling a hole lengthwise in a

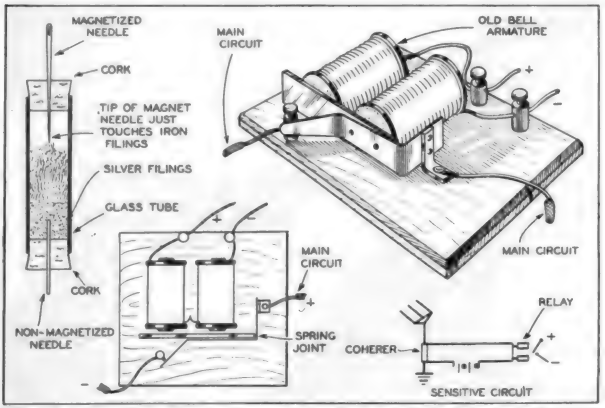
piece of wood five inches long and an inch in diameter. At one end the hole is drilled large enough to admit the base of the bulb, which is glued in. The wire from it is run through the handle and soldered to the coil as shown in the drawing.

EXTRA prize-winners who were awarded Honorable Mention and checks for $1.00 each are as follows: Max Bowers, Box 108, Lorenzo, Texas; W. P. Brownlow, 903 W. Watanga Ave., Johnson City, Tenn.; James G. Burgess, Box 94, Hiawatha, Utah; Andrew Frinke, Collinsville, Ill.; William Edward Gardner, 100 McLean Ave., Yonkers, N. Y.; Lyle L. Guidinger, 420 Seventh St. N., Wahpeton, N. Dak.; Wayne Gustafson, 441 Newport Ave., Webster Groves, Mo.; Helge Hogstad, Gardner, N. Dak., Forrest L. Hoyt, Unionville, Mo.; Charlesworthy Kalbaba, Cuba, Kansas; Raymond Lewis, Lawson, Mo.; H. G. Pack, Box 1183, San Francisco, Cal.; C. D. Paulus, 1539 West Harrison St., Chicago, Ill.; E. C. Perkins, 1218 Park Ave., Bremerton, Wash.; Alvin Porter, 1907 S. Michigan St., South Bend, Ind.; Charles E. Roberts, 24 So. Second St., Keokuk, Iowa; Raymond Rosholm, 932 D. St., Omaha, Neb.; Howard H. Seibel, 276 Glenwood Ave., Buffalo, N. Y.

Making a Coherer and Relay

FOR running models by remote radio control a dependable coherer and a good relay for taking the small currents and switching on larger ones are needed. The drawing below shows how to construct a good coherer and relay. Take a small bottle, cut off the bottom, cork it and drop in a good half inch of silver filings. Cover the top of the silver with iron filings, apply a cork at the top, and run a magnetized needle through it so that it barely touches the iron filings. A non-magnetic needle is run through the bottom cork for the connections, as shown. This coherer must be used vertically.

The relay is an electric switch that can be made from any doorbell. Bend the switch post around and the switch tongue out so that when the magnets are energized the circuit is closed; the drawing shows how this is done with a doorbell to make a coherer out of it. In use the coherer sends a slight current through the magnets of the relay, a light 2-volt battery doing the work so as not to throw a heavy load on the coherer. Then the relay can be made to turn on a current of any intensity. The drawing shows the wiring circuit.

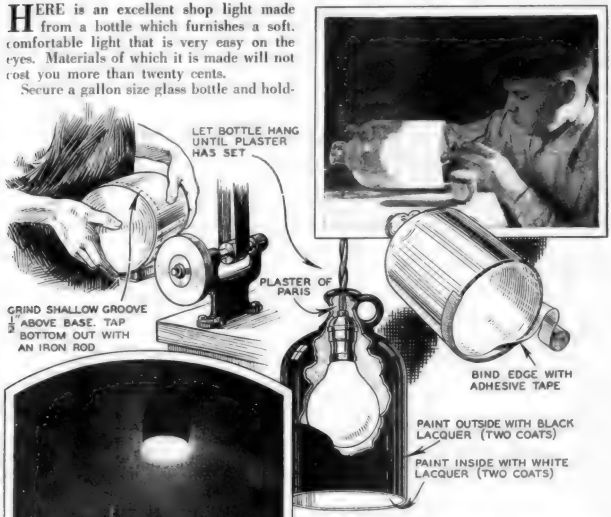


Following the above drawing, you can construct a good coherer and relay for remote radio control.

Bottle Flood Light Is Excellent for Shop Illumination

HERE is an excellent shop light made from a bottle which furnishes a soft, comfortable light that is very easy on the eyes. Materials of which it is made will not cost you more than twenty cents.

Secure a gallon size glass bottle and holding it against an emery wheel, grind a shallow groove entirely around it a half inch above the base. An iron rod inserted through the neck will enable you to break the bottom off by tapping it gently. Smooth any rough edges on the emery wheel, so that a reasonably smooth surface is obtained.



Insert photo shows method of applying lacquer.

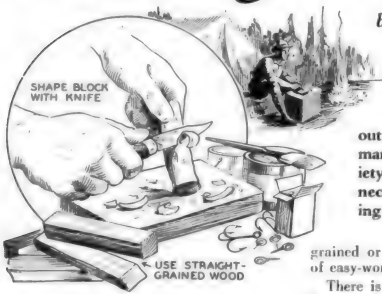
Note the soft, diffused glow of the bottle lamp.

Place an electric light socket in the neck of the bottle. Then mix up a little Plaster of Paris and fill in the opening around the cord at the top, as shown in the cutaway view in the drawing, letting the bottle hang suspended by the cord until the plaster has set. Now give the inside of the bottle two coats of white lacquer and the outside two coats of black. It is a good idea to bind the edge of the bottle with adhesive tape to prevent cutting the fingers.

When the lacquer coats have dried the reflector will be ready for use. If bulbs larger than 150-watt are used in the lamp, it will be a good idea to insert a pair of small metal or paper pipes through the Plaster of Paris filling to afford an outlet for the heat generated by the bulb. — Dale R. Van Horn.

Whittle Your Own

by WALTER E. BURTON



The first step in whittling the plug lure is to trim it to a cylindrical shape before shaping is begun.

With a sharp jackknife as your only tool you can carve excellent fish lures out of wood which will catch as many fish as the purchased variety. Mr. Burton gives a few necessary pointers on the whittling art in this interesting article.

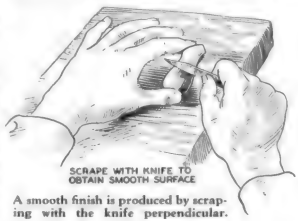
THE next time you embark on a camping or fishing expedition, toss a few blocks of straight-grained, easily whittled wood, a good knife, oil stone, a few small screw eyes, some double and triple fish hooks, and some brilliant-hued paint into your collection of equipment. Then, on lazy afternoons between bites (of fish or insects), you can increase your collection of plug lures simply by doing a little old-fashioned whittling.

The making of plugs which look like fish, mice or other animals, and which do all sorts of intricate twisting when drawn through the water, is not a difficult matter. In fact, it is surprisingly easy, and offers an inexpensive means of acquiring a valuable collection of plain and fancy lures—and what fisherman does not delight in possessing eight or ten times as much equipment as he needs?

In selecting the wood, obtain pieces which have a straight grain. This enables you to split out with ease sections for the baits. The wood should not be too soft, but should at the same time be of a kind that will whittle easily. Of course, something like maple is ideal because it will hold the screw eyes firmly and will stand a lot of punishment, but something a little softer, like poplar or any other wood not too open grained or splintery, is preferable because of easy-working qualities.

There is almost an unlimited number of baits that you can whittle. Start with the simpler ones of the "—oreno" type, and then you can work up to something more complicated—the ones with fancy spinners, eyes, scales and the like. You may even invent lures of your own that will bring in record catches. One of the easiest methods of determining the constructional details of the bait you whittle is to study a fishing tackle catalog, fishing handbook, or the tackle box of a friend. Then you can make copies of the baits you think will get the fish.

The block of wood is split roughly to size, and is then shaped carefully with the knife. Give considerable care to getting a perfectly-shaped plug, and one that is not so lopsided that it will not track properly in the water. In the case of one type of bass lure, the plug is whittled with parallel sides, and a tail with a curved taper that

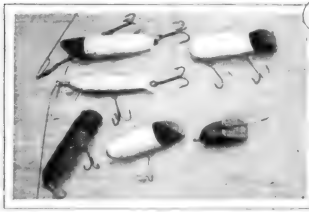


A smooth finish is produced by scraping with the knife perpendicular.

Fish Baits

terminates in a point. The front is cut out so that there is a scoop-like, slanting depression that gives a diving and wiggling motion to the bait when it is drawn through the water. The body of the lure is painted white, and the head a bright red. A coat of waterproof varnish over the paint is recommended.

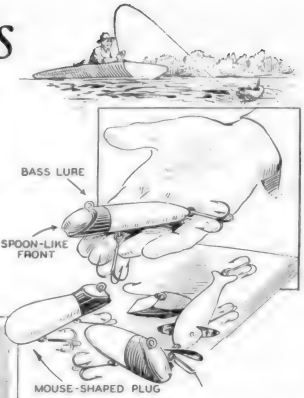
Fittings consist of double or treble hooks fastened to the tail and belly, and an eye in the center of the hollow nose for the line swivel and leader. If desired, imitation fish eyes can be fastened to the head. These



Typical hand-whittled baits which have lured many a fish to the frying-pan are shown above.

consist of small glass beads held in place with round-headed brass tacks. A little depression is cut in the wood so that the beads will not protrude too much. The hooks are fastened with small screw eyes, preferably of brass. Care should be taken that the hooks are securely anchored in the wood so that a prize catch cannot get away with a hook sticking in his mouth and a screw eye dangling. That is the chief reason why a soft wood is to be avoided.

More complicated designs than the one mentioned can be made, but the whittling of the plug is almost identical in each case. It is in the painting and adding of spinners and other appendages that the baits differ most. With a little care, good imitations of real fish that are food for game fish can be made. In doing this, paints of the correct colors are used for the under side, back and the like. Scales can be imitated by dotting the surface with a small brush, or by



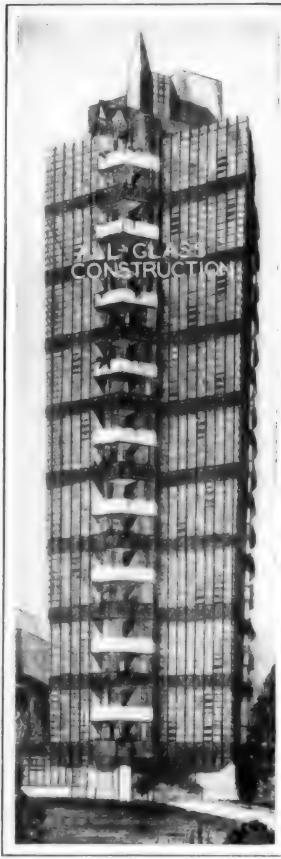
There are innumerable shapes in which plug lures can be cut; every fisherman has his favorites. A few popular types are shown above. The spoon-like front of the bass lure causes a wobbling motion when it is pulled through the water. Other plugs are shaped like mice or tiny fish. In the photo at the left the dark-bodied lure has a painted red head and a body covered with tinfoil, protected by a coat of varnish.

stippling the paint through a netting. The easiest way to apply the final coat of varnish is to dip the plug in the varnish before fittings are attached, and then hang it up to dry. Spinners are cut from sheet aluminum or nickeled brass, the latter being recommended because of its greater strength.

Some very successful catches which formed the basis for unusual fish stories have been made with whittled baits such as those described. It is true that home-made plugs are usually not quite as elegantly finished as the manufactured ones, but it seems to make no difference to the fish. And, after all, the fish which is angered or attracted by a flash of brilliant color through the water is the ultimate goal.

If you prefer, one of the quick-drying lacquers now on the market can be used in finishing the baits. Lacquer colors are extremely brilliant, and baits finished with them can be used within a couple of hours, since they do not have to dry overnight.

First All-Glass Building Soon to Rise in City of New York



No structural steel will be used in this building.

FROM designing the Imperial Hotel in Tokio, Japan—the only structure of any importance that stood up under the earthquake a few years back—to building the first all-glass house in the heart of New York City is a pretty long step. But it is being taken by Frank Lloyd Wright, world-famed architect, who proposes to erect a building along the lines of that shown in the illustration, at Second Avenue and 11th Street. It is the first of several that Mr. Wright plans to build within the next few years.

One of the unusual features of this building is that no structural steel will be used anywhere in the glass house. In detailing his idea, Mr. Wright pointed out that he plans to build this all-glass tower to a height of 18 stories and set a two-story penthouse on top of it for his own personal use. The walls of the building will be made of clear, heavy plate glass and the floors will be of concrete inlaid with a rubber composition to deaden noises. For decorative purposes, balconies and parapets, Mr. Wright proposes to use copper.

Handy Kit for Carrying Files

FILES are an unhandy thing to pack along with other and heavier tools. Take a square of sheet rubber cut from an old inner tube of a fairly large tire. Roll the first file up with one side, laying the other files in the roll as each turn covers up one. In this manner each file is separated from the other, the cutting faces in contact with nothing but the soft rubber. Snap two or more bands cut from the tire around the bundle as shown, and you have them all in an easily carried package. They are safe from damage through contact with themselves or anything else, and the beauty of it is that it costs practically nothing to make.

An old inner tube makes a handy kit for carrying files.

Pipe Fire Escape Speeds Emptying of Large Buildings

A PATENTED circular fire-escape has been developed by which people on the upper stories of burning buildings can slide to the ground below. The fire-escape consists of a large tube of galvanized steel which extends from an upper floor level to the ground. As it is set at an angle, people can slide through it without difficulty. The upper end of the tube enters the room. Over the entrance is a door, so that no drafts will enter the room through the fire-escape. When fire is discovered, the people in the building sit in the upper part of the tube, slide down it, and land on the ground below.

Connections to this fire escape can be made at any floor. Those on the slide are whisked to safety.

Paper Strips Run Radio and Talkie

A RECENT Austrian invention combines radio, phonograph and a "talkie" projector. A strip of paper records sound impulses that can be reproduced by this instrument. It can be used as a radio or phonograph by the turn of a few knobs and dials.

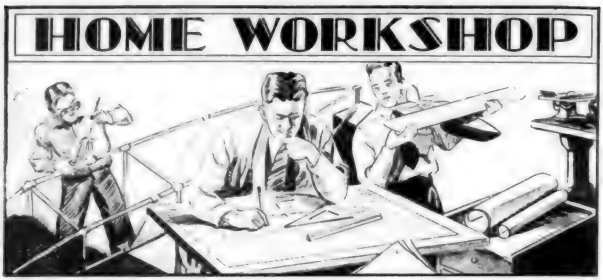
Professor Thirring, the inventor, hopes to include in this idea a talking newspaper.

The combination radio, phonograph and talkie. Paper strips carry the sound impulses to instrument for transmission. The inventor hopes to have newspapers read aloud thru this idea.

New Clock Records Flying Time

A NOVEL feature of the new aviation clock for recording time of flight is the extra pair of red hands set by hand to mark the starting time. They remain in this position and at the end of the flight the difference between the red hands and the clock hands gives the duration of flight.

The clock is finished to match all other Pioneer instruments so that it is interchangeable with other instruments on the board and the diameter and mountings are Army, Navy and S.A.E. standard. It is provided with a luminous dial and has a large second hand and double mainspring, with the winding and setting knob placed in front and at the bottom to render it accessible. The clock is standard in two movements—7 and 15 jewels, to suit the purchaser.



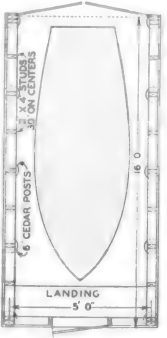
Edited by A. NEELY HALL

The season for outdoor activity is at hand, and Mr. Hall recognizes it in his department this month with plans for a motorboat house and an outdoor basket-ball court. Mr. Hall is nationally known as author of such handicraft books as "The Outdoor Boy Craftsman," "Big Book of Boys' Hobbies," etc.

A Shack to House the Motorboat at the Summer Camp

YOU don't push your car up an incline to get it inside the garage, normally. You wouldn't tolerate a plan which did not permit you to drive in and out easily. Why not enjoy the same convenience in parking your motor boat? You may argue that a boat house built over water is not practical because of the destructive action of ice on the supports. True, that is an objectionable feature, but if you will build a small shack of the type shown in the photograph, and will drive posts well down into the lake or river bed, and anchor the shore end securely, it will not be a difficult job to straighten the posts and plumb up the shack, if need be, in the spring.

The type of shack shown in the photograph is inexpensive to build, and can be built quickly. Driving the foundation posts is three-quarters of the work, and under favorable conditions, it is a simpler job than you might imagine. If you have built piers, you have acquired the knack of sharpening post ends and driving them with a maul; if not, look about for some native talent. In the spring or early summer, you will have no difficulty in locating an experienced man for the job, and you can trust him with the problem of determining the length of posts needed, the number, the depth to drive them, and other details. While wooden posts are the simplest supports, if the lake or river bed is of stone, which would make it difficult or impossible to drive posts, it may be necessary to substitute cribbing, or a combination of the two. A satisfactory method which I have seen employed is a series of cribs, each formed of a ring of poles placed vertically, and interwoven with vines, brush and small branches, then filled with stones, after the posts had been set up in the centers.



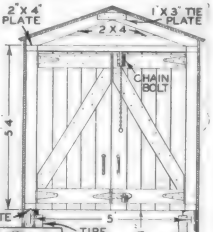
Dimensioned view showing motorboat inside the shack.

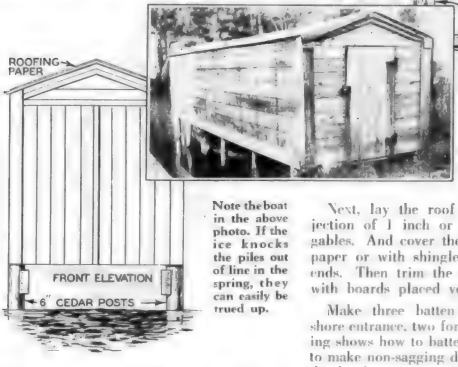
Complete dimensions are not shown, as they will be determined by the size of the motorboat for which you build.

When the foun-

dation posts have been driven, saw off their tops square, 18 inches above the water line. Then connect each row of side posts with a 2-by-4 plate, also the two end posts at the shore. Spike the plates to the post tops. It is of importance here to level up the plates, and to make certain that the corner angles are right-angles.

Now throw boards across the plates for a temporary work platform. Cut the requisite number of studs for the walls. Five feet will be long enough for them. Spike a pair of studs together for each corner post and spike them in place to the sill plates; then set the intermediate studs with a spacing of 24 or 30 inches from center to center, spike, and brace them. Spike the top 2-by-4 plates to the top of the studding.





With these drawings and the photograph to go by, you should have no difficulty in building yourself an excellent shack to house the motorboat.

Note the boat in the above photo. If the ice knocks the piles out of line in the spring, they can easily be trued up.

You can sheathe the walls with matched boards, or shiplap, but it is not essential that the walls be tight. Use 8-inch or 12-inch boards. When you have sheathed the framework to the height of the top plates, mark and cut the rafters. The shack in the photograph has a one-sixth pitch. That is to say, with a span of 5 feet 6 inches, it is 11 inches higher along the ridge than it is along the wall plates. With this information, and a carpenter's steel square, it is no trick to mark off the 2-by-4 rafters, so the ends will have the correct cuts to make a roof of one-sixth pitch. Spike the rafter ends together and tie them with 1-by-3-inch plates.

Next, lay the roof boards, with a projection of 1 inch or so at the eaves and gables. And cover the boards with roofing paper or with shingles. Sheathe the gable ends. Then trim the corners of the walls with boards placed vertically.

Make three batten doors, one for the shore entrance, two for the front. The drawing shows how to batten the boards together to make non-sagging doors. It also suggests the hardware to use for the front pair—strap hinges, hinge-hasp for padlock, chain bolt for top of lefthand door, and a pair of handles. Nail a vertical strip of 1-by-3 to the outside of the left-hand door to hold the right-hand door shut when the chain-bolt on the left-hand door has been latched.

A two-foot platform is wide enough for a landing. Nail strips of automobile tire casings to the edge of the platform, and to the post supports, for bumpers.

The photograph shows the boat shack before it had been painted. Don't neglect the paint job. Painting the shack will be good work for one of those vacation afternoons when there is nothing exciting to do. In the winter the boat can be stored under the cottage porch or in some other available building on shore.

These Outdoor Basket-ball Goals Are Simple to Erect

For outdoor practice during spare time, a basket-ball goal such as this will be a source of pleasure.

IT IS not difficult to erect the goal posts, backboards and goals for an outdoor basket-ball court, and if your school has a forge shop, you can make the goal frames, too. But my thought in preparing this article was that you fellows might want to set up a single goal in your back yards or in vacant lots, for spare time practice. The cost will be small, and a group of you can share it.

The diagrams show a framework for a backboard. The supporting post should be 6 inches square and 17 feet long. This will provide a length of 5 feet for the height of the frame, a length of 9 feet between the frame and the ground, and a length of 3 feet to set into the ground. Notch the upper part of the post as shown for the horizontal members of the framework to fit in. Cut the ends of the slots with a saw, and split out the wood and trim up the slots, with a chisel.

Next cut the framework pieces and halve the ends, as indicated, so that they will fit together with surfaces flush, and bolt them together with ¼-inch bolts. Notch the vertical pieces of the frame at the proper point to receive the ends of the intermediate horizontal piece.

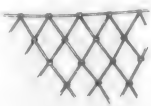
Spike the horizontal members of the framework to the post support, or attach them with lag-screws.

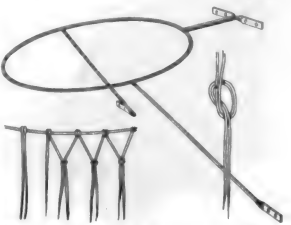
There are two ways to cover the goal backboard. The simpler and cheaper way is to use poultry-netting with 1-inch mesh, as the backboard in the photograph is covered. The other way is to use matched boards. The board covering is the better rebounding surface, but it makes a heavier backboard to set up, and offers more wind resistance.

Use a post-hole auger, if you can get one, to dig the post hole. By filling in around the post with earth and stones, and tamping the filling with the end of a stick, to make it compact, the post will stand erect, but for permanent anchorage, it is better to enlarge the hole to a diameter of about twenty inches, and fill in with concrete.

The metal frame for the basket-ball goal can be made by a blacksmith, unless you have access to a school forge shop. Five-eighths-inch round iron should be used for the ring. The ends should be bent, flattened, and tapped for ⅜-inch lag-screws. The two braces should be welded to the ring at an angle of 45-degrees, and their ends should be flattened and tapped for screws. Screw the ring to the two lower horizontal members of the frame, with ⅜-inch by 2½-inch lag-screws.

Goal nets can be purchased, but it is no trick to make one. Use heavy twisted cord of the kind





The metal goal frame is shown together with the method of tying the cord to form the netting.

used by masons for plumb-lines. Cut 18 5-foot lengths of the cord, double them, and loop them over the goal frame as shown in one of the drawings. Space the 18 cords equidistantly around the ring. The spacing will be about 3 inches. With the cords attached, join one strand of each to a strand of the cord next to it, as shown, using an overhand knot. Form these knots in a straight row 3 inches below the ring. In the same way, form a second row of knots 3 inches below the first row, then a third row below the second, then a fourth, a fifth, and so on. Make each row ¼-inch closer to the preceding row, to give the sides of the net the right amount of pitch, that the ends of the cords may come together at a point about 18 inches below the rim.

An Extension for the Bit Brace

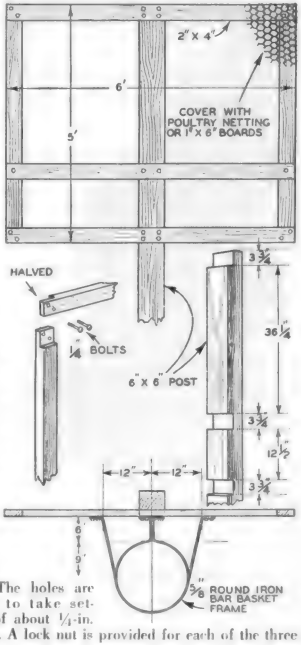
A BIT brace extension is a most useful tool for boring holes in joists and studding for electric insulating tubes, and for other purposes where an extra long auger shank is needed. Most home tool kits, however, are without this useful tool. A serviceable extension can be made in a short time from a piece of ½-inch pipe of a length depending upon the increase desired in the auger bit length.

The pipe is cut to length and the inside opening reamed out at the ends so that the burr is removed, permitting the square portion of the auger bit to enter smoothly. Next three holes are drilled, on about ¾ inch from each end, and the third at such a distance from one end that it will be opposite the square portion of the inserted bit shank. The holes are tapped to take set-screws of about ¼-in. diameter. A lock nut is provided for each of the three set-screws.

In using the extension, a drill bit is first inserted in the brace, and the end of the extension having but one set-screw is slipped over it. The set-screw is tightened so that it rests in one of the bit grooves. Of course, the drill bit should be large enough to fit the inside of the pipe rather snugly. The auger bit used for boring the hole is inserted into the other end. One of the set-screws holds the square base so that it will not slip, and the other holds the shank so that the bit will not pull out. A small piece of sheet metal is inserted on one side of the bit shank so that it will be properly centered.

With this arrangement you can reach into spots practically inaccessible to an ordinary bit brace, as indicated by the drawing at the left.

Dimensions for the Outdoor Goals



The Church MID-WING

This shows the ground view of the Church Mid-Wing monoplane when it is in the air. Note the slot through which the pilot has a fair view of ground.

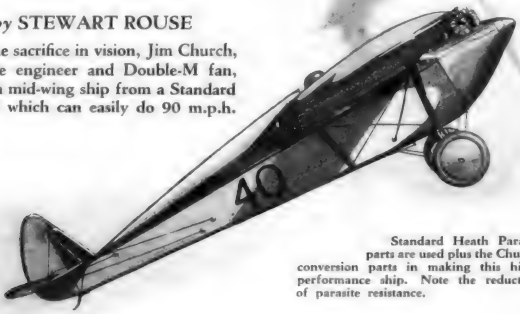
IMAGINE ourselves at the National Air Races at Cleveland. There are 100,000 spectators thrilling at sight of a group of tiny light planes which come droning and whining across the flat prairie to the starting pylon—the checkered orange and black tower before the grandstand. They pass the pylon in a group, a race horse start, and are off in a mad dash that will not end until their knife-like, glistening wings have cleft the invisible air of ten laps around that five-mile triangular course marked by three tall pylon towers, the farthest being invisible in the light ground haze.

A moment after the start the little planes are so far away that they can hardly be seen as they skim along like projectiles over the plain, flying about eight feet high, because any racing pilot will tell you that planes fly faster at that altitude. Cries of amazement are heard among the spectators. An eager young man wants to know if

SPORT MONOPLANE

by STEWART ROUSE

At some sacrifice in vision, Jim Church, versatile engineer and Double-M fan, builds a mid-wing ship from a Standard Parasol which can easily do 90 m.p.h.



Standard Heath Parasol parts are used plus the Church conversion parts in making this high-performance ship. Note the reduction of parasite resistance.

that fast yellow-and-black one is the famous "Baby Bullet" and another excited fellow screams in his ear that the "Bullet" is not entered in this race, which is Event No. 2, for planes with 100 cubic inch piston displacement or less, and that fast one is the Church Mid-Wing Sport Monoplane which he hears is built from the Super Parasol fuselage and wings together with a few conversion parts designed by James Church and can do better than 90! The attention of the mammoth crowd is taken again by the return of the racers completing their first lap. Here they come almost on the ground it seems—who's ahead? No. 40, the yellow-and-black, the Church Mid-Wing, is a long way ahead. Freddie Lund, magnificent pilot, holder of the world's outside loop record, who is flying her, dives at the pylon.

By doing away with midsection cabane struts, the Church job does 30 m.p.h. more than a Parasol.

Profile Scale Views Give Accurate Idea of Clean Lines of This Ship

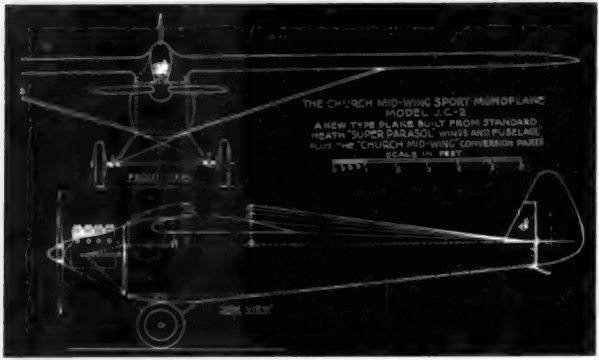


Fig. 1. This is the profile and front elevation drawing of the cleverly converted monoplane. It shows the somewhat flatter bracing, with the consequent reduction in cabane strut interference which partially accounts for the speed increase of about twenty to thirty miles per hour.

Vertically he banks around it with his wing tip almost dragging the ground and is off again in a twinkling. The other contestants hurl their planes around the pylon in dizzy succession, the backwash from each plane throwing up a regular explosion of dust from the ground at the foot of the pylon.

On and on through the golden sunlight of the September day dash these little manbirds, each guided by a high heart and a steady hand, each a manifestation of the wonders of physics and chemistry as yet imperfectly understood by man. The other planes fight hard to cut down the yellow-and-black plane's lead, but to no avail.

Imagine the thrill of the pilot, with throttle wide, cleaving along in the lead, pylon after pylon, lap after lap. With the crowd No. 40 is clearly the favorite, when, just at the beginning of the fifth lap her pilot's heart sinks to hear that all is not well with that little hummingbird of a motor in the nose, for it falters in its steady roar and limps bravely on, on three cylinders, and Freddie Lund has to land in honorable defeat while his opponents stream past overhead in quick succession. Being in walking distance of the grand stand pylon, Freddie walks over and is met by a disappointed but still smiling, yellow-haired, large-framed young man. They talk the race over. This genial looking man is James Church, designer and builder of the Church Mid-Wing, and an interesting train of events has brought him this day to the races.

Jim is a technical man. He has been designing electric elevators and large machinery in Chicago for several years with good success. He was badly bitten by the airplane bug as a boy and has never even showed signs of recovery from the bite. Consequently, he built and flew one of the first Heath "Parasols" in Chicago three or four years ago. This one had Thomas-Morse scout wings. Ed Heath used to fly it so high you could hardly see it. It was somewhat faster than the "Super Parasol" type, but would not climb so fast.

In the winter of 1928-1929 Jim built the first Church Mid-Wing Sport Monoplane. He built it from raw material. He could have built any other type, but this type seemed to him the ideal light plane. Liking the Super Parasol fuselage, he

built one of the welded type with minor changes which will be described in the technical portion of this article. The Super Parasol wings are also mighty strong and good, so he built a pair with the wing beam ends drilled with different holes, and the wing strut fittings he replaced with longer ones shaped for the new angle of the wing struts in the new design. The idea was to build a ship with as little parasite resistance as possible.

He built a sort of steel tube superstructure at the cock-pit opening, to support the wing butts about 2" above the top longerons of the fuselage which would give the pilot downward vision between the wing and top longeron. The regular streamline wing struts of the type used on the "Super Parasol" were used, only in shorter length. A nice snug cowling and turtleback were

Photo - Diagrams Locate Various Parts

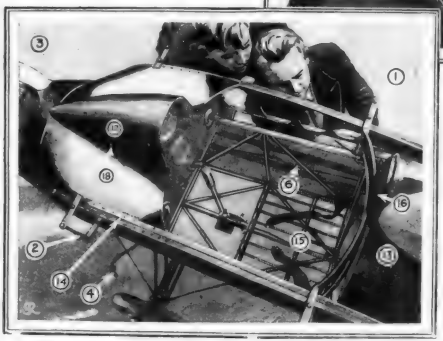


Fig. 5. A view of the Church mid-wing monoplane looking forward. Note the neat instrument board. A guide to the parts will be found at the end of this article, properly numbered. In the foreground note the rear wing beam fitting and the two curved tubes joining it with its companion fitting on the left longeron. There really are but very few parts needed to make the conversion. Reduction of parasite is attended by flatter bracing.

Fig. 6. Jim Church points out an inter ..ng point of design to Stewart Rouse, airplane illustrator and autho.., and producer of this article.

built which resemble those of the "Baby Bullet", and the propeller was provided with a spinner. As the tanks are in the wing butts as in the Super Parasol, and as this does not give sufficient fall from the tanks to the carburetor, it was necessary to install a Church Special Extra-Long Carburetor Flue on the Heath-Henderson engine used in the Church Mid-Wing to place the carburetor low, for more gravity fall. Rather unaccountably this long flue gave Jim's Heath-Henderson 3,000 instead of its usual 2,800 R. P. M., an increase of 200 rev's!

As the ship neared completion it looked so nicely and the motor worked so well

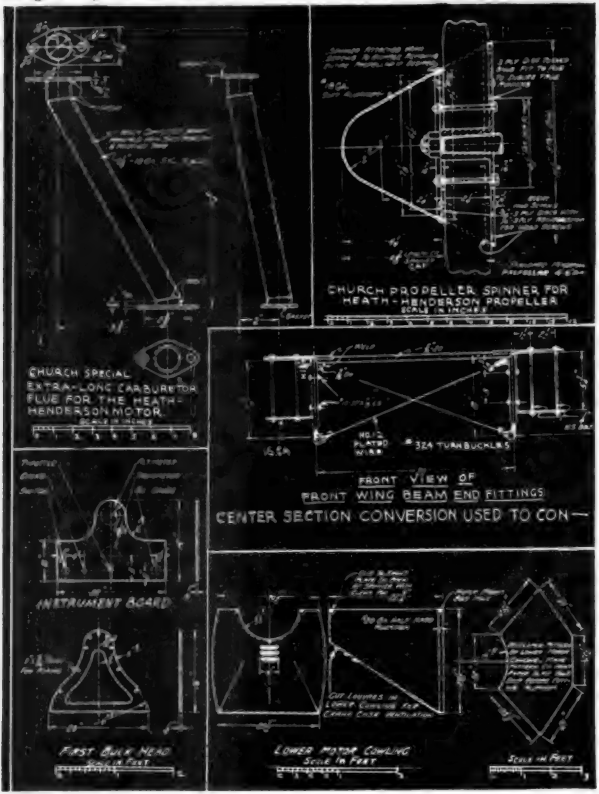
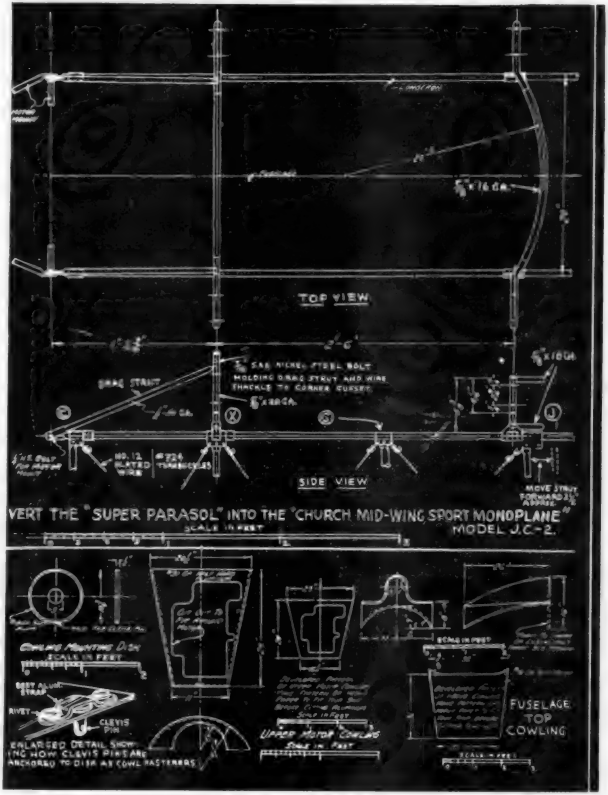


Fig. 2. This drawing and the one on the opposite page show the construction of the various parts used in converting the Super Parasol into the Church Mid-Wing monoplane. Note intake manifold.

that Jim decided to enter it in last year's National Air Races at Cleveland. He sent in his application in April and was pleased to receive a notification from the race committee that his plane was entered in the Closed Course Race Events, Event No. 2,

Conversion Center Section Compression Struts; Cowl Details Shown



For some strange reason the longer manifold, installed so that the wing-butt tanks would have good gravity feed, revved the motor up 200 extra r.p.m. Here are cowling and compression strut details.

for planes powered with motors of 100 cubic inches or less. Finally the yellow-and-black Church Mid-Wing Sport Monoplane was finished and ready for flight tests.

The day of the flight tests was just right. Jim was in a fever of anticipation and I was

Church Mid-Wing Monoplane Is Easy to Enter

Fig. 8, top view; Key to details—1, link cable between top aileron horns; 2, gas filler cap left wing; 3, left wing rear beam fitting; 4, aileron cable to stick; 5, step; 6, turtleback; 7, air scoop; 8, front flying strut fitting; 9, elevator control cables; 10, rudder cable; 11, tail skid; 12, bottom motor cowl; 13, Church shows louvres; 14, hole for aileron cable; 15, wing butt socket; 16, gas line to right wing tank; 17, front wing beam fitting.

almost as eager as he. Ed Heath test flew the new light plane and it surprised us all. Its top speed was around 90 m.p.h. and we couldn't see that it landed any faster than a regular Super Parasol. One thing that impressed us was the easy way a pilot can climb in and out of the cockpit; this is well shown in Fig. 8. As the ship was all right it was dissembled and taken back to Chicago for shipping preparations. The motor then received final adjustment and the *black walnut* racing propeller of 4'6" diameter and 2'4" pitch was completed.

The National Air Races were from August 24 to September 3. Jim Church secured a vacation from work for this period, and the week preceding it. Ed Heath and Jim decided to form a caravan and tow their entries to Cleveland. Ed's well known old 12-cylinder Packard school truck, with pictures of airplanes printed all over it like a circus wagon, was to lead with two "Super Parasol" race entries, the fuselage of one being in tow. Jim was to follow in his Buick with his Church Mid-Wing fuselage in tow and his wings in a big crate on the roof. The Baby Bullet was sent by train in its magnificent crates.

This caravan left Chicago at 5 A. M. one fine summer morning a week before the races, with Jim, Ed Heath and about six mechanics. It was a picnic. At first they were afraid to turn corners for fear of hurting the fuselages, but as the 400 mile trip wore on, the speedometer on the old Packard truck was hanging between 60 and 70 m.p.h. and the wheels of the towed fuselages had to be greased about every 45 miles. Some of the bumps threw the fuselages in the air, but they were undamaged. They made a fast trip, for Jim's Buick had a hard time keeping up, and that's saying something. The odd caravan attracted a lot of attention whenever it stopped en route.

On arriving at Cleveland the Heath-

Church caravan drove to the Cleveland Municipal Airport, about 15 miles from the city's heart. On arriving at the airport, they were accorded royal courtesy and attention by the various committees. They were given large hangar space together. Setting up the planes was great sport and everyone enjoyed it. A crowd of spectators was always on hand and some of the comments they made were amusing. They insisted that the Church Mid-Wing was the Baby Bullet. Many thought the Bullet was a model airplane and were astounded to see Ed Heath get in and fly away with awful velocity. *It was noticed, though, that no airplanes attracted so much attention and appreciation as the light planes.*

Newspaper men took numerous photos of the Church Mid-Wing Sport Monoplane in action, and large pictures and remarkably inaccurate stories about Jim and his "wonder plane" appeared in the papers; in fact, in reading about himself Jim learned many new things about his history that he didn't know himself. Newspaper accounts are like that. Mostly hooey.

The races were wonderful to watch and Jim could hardly wait until his plane should be in competition. Two days before the Race Committee told Jim that, as his pilot did not have the F. A. I rating, he could not race. Naturally Jim was greatly disturbed by this bad news. In Freddie Lund, Waco test pilot, and holder of the civilian outside loop record, a matchless pilot, he found a real friend for Fred agreed to pilot No. 40, the Church Mid-Wing.

The day of the race arrived, the planes were wheeled forth to the starting line with a mechanic at propeller and tail. The motors were warmed, cameramen took their pictures and stood back, the starting gun was fired and the tiny ships were off in Event No. 2, Closed Course Races, National Air Races! How the motor of No. 40 failed has already been told. The exhaust valve in No. 3 cylinder warped because of an incorrect carburetor adjustment. But, win or lose, air racing is its own reward in high hearted sport; the gold prizes are not large, but that is not what the air racers race for!

Here are the general specifications of the Church Mid-Wing Sport Monoplane:

Span, 26 ft. 8 in.; chord, 4 ft. 6 in.; angle of incidence, 1 degree; wing area, 110 sq. ft.; aileron area, 10 sq. ft.; elevator area, 5.2 sq. ft.; stabilizer area, 5.5 sq. ft.; rudder area, 3.8 sq. ft.; length over all,

Drawing of Spar End Fitting Details

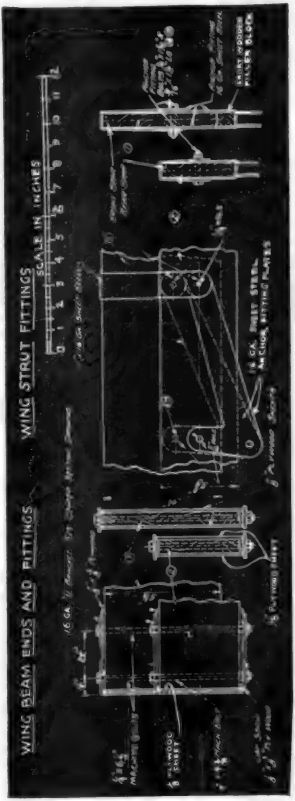


Fig. 3. This drawing shows the construction of the wing beam ends and the changes in the strut or flying tube fittings. Due to the lower angle of the flying struts the angle of the spar fitting must be changed to correspond. The center drawing shows both front and rear placings.

16 ft. 9 in.; height over all, 4 ft. 7 in.; weight, empty, 260 lbs.; rate of climb, (first minute), 650 ft.; useful load, 300 lbs.; gas capacity, 5 gals.; oil capacity, 6 qts.; high speed, 90 m. p. h.; landing speed, 28 m. p. h.; cruising radius, 400 miles.

Technical. Building the Center Section Conversion: We will assume that the reader is already in possession of a complete Heath "Super Parasol" Sport Plane or its plans with either the bolted or welded type fuselage, and familiar with its constructional details. In the bolted type it will be necessary to move the longeron fitting at "J" forward about 2½". See Fig. 2. This done, another wrap-around 18 ga. longeron fitting must be made and fastened in place on the longeron, with a rivet made from a 2 penny shingle nail; just in front of fitting "J" and separated from it by a ⅛" space to hold the loop ends of the No. 12 plated diagonal brace wires which cross inside the fuselage at this point. The large, newly made fitting just described embraces a simpler wrap-around longeron fitting of 18 ga. sheet steel, the inward pointing ends of which hold the horizontal brace wires of the horizontal bay behind the pilot's shoulders. The upward pointing ends of the large fitting embrace the lower flattened end of the rear vertical strut of the center section conversion to which it is attached with a 3/16" nickel steel bolt. Note that whenever a tube is flattened at its end a 3" reenforcement of the next smaller size tubing of the same gauge must be slipped in the end to be flattened, and the flattening must be done with the tube and red hot. All four vertical struts of the center section conversion are made in this way of ⅝"x20 ga. Shelby seamless tubing. Their tops are cut as shown in Fig. 2, at 45°, and the horizontal top struts are laid on and their 45° cut ends welded to the tops of the vertical struts.

Vertical Struts

Note that the rear pair of vertical struts are connected top and bottom with curved horizontal struts, see Fig. 2, Fig. 5 and Fig. 6. The top curved strut is welded to the vertical strut tops, and the bottom curved strut has its flattened and bent ends held by the 3/11" bolts, which hold the rear vertical struts to their longeron fittings. These curved horizontal struts are of ⅝"x16 ga. tubing. They are bent by filling them with sand, plugging the ends with wood plugs and bending them gradually around a curved surface. The sand keeps the tubing from crushing. When bent to the right curve, let out the sand and cut the ends properly. The wing beam end fittings, see Figs. 2, 5, and 6 are made of 16 ga., half-hard cold rolled steel which is the grade used for all metal fittings. These fittings are shaped as shown and welded and bolted with 10-32x7/18" machine screws to the vertical struts.

The holes for these bolts must be reenforced by short tubes welded in the holes. Note that the upper portion of these large clevis-like fittings is two ply and welded together along its edges. The top ply extends inward along the top of the top horizontal strut for several inches and is welded to the horizontal strut. The front bay of the center section conversion formed by the front vertical struts and the horizontal top strut between them is braced by a pair of diagonal No. 12 plated wires with No. 324 turnbuckles. These wires are fastened at their lower ends by looping the longerons, and at their upper ends by a shackle fastened to a 3/16" bolt through a 16 ga. gusset welded in the angle of the vertical and horizontal struts. This same 3/16" nickel steel bolt also holds the flattened and bent end of the sloping ½"x20 ga. drag strut, the lower end of which, flattened and drilled, is held by the ¼" nickel steel motor mount bolt passing through the front end of the top longeron.

Corresponding changes in the welded type fuselage can easily be effected.

Changes Necessary in the Wings. The wing beam ends must have new holes bored in them as shown in Fig. 3, two in each wing beam. One of these holes is 1½" from the end, the other 4" from the end. They are drilled down vertically for the ¼" nickel steel bolts of the wing beam end fittings.

New wing strut fittings must be made of 16 ga. sheet steel and attached.

The wing struts must be shortened, the drag and anti-drag cables, and lower aileron cables shortened.

Changes in the Engine. The Church Special Extra-Long Carburetor Flue must be made up of 1¼"-18 ga. steel tubing as shown in Fig. 2.

Cowling. 18 ga. half hard aluminum

Photo Diagram Marks the Salient Features of Fast Church Monoplane

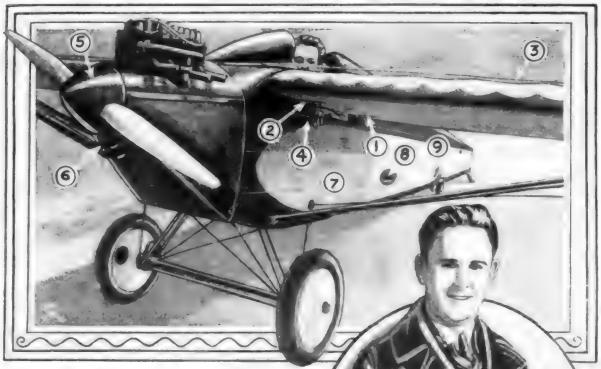
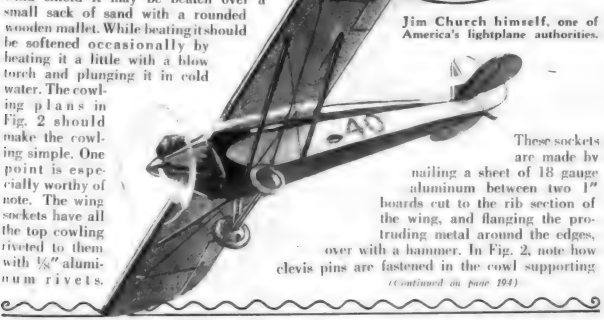


Fig. 7. Front quarter view. 1, rear beam fitting; 2, front beam; 3, link cable; 4, gas line; 5, spinner; 6, louvres; 7, aileron cable; 8, step; 9, elevator control cables. Pilot is snugly cowled. Note vision space where pilot's hand extends.

should be used for the parts of the cowling which require no beating in shaping. 18 ga. soft aluminum should be used for those which do. The wind shield is the only part of the Church Mid-Wing's cowling which must be beaten. To shape the wind shield it may be beaten over a small sack of sand with a rounded wooden mallet. While beating it should be softened occasionally by heating it a little with a blow torch and plunging it in cold water. The cowling plans in Fig. 2 should make the cowling simple. One point is especially worthy of note. The wing sockets have all the top cowling riveted to them with ⅛" aluminum rivets.

Jim Church himself, one of America's lightplane authorities.



These sockets are made by nailing a sheet of 18 gauge aluminum between two 1" boards cut to the rib section of the wing, and flanging the protruding metal around the edges, over with a hammer. In Fig. 2, note how clevis pins are fastened in the cowl supporting

(Continued on page 194)

All Ready, Lift! Brains only

Place your hands flat against a solid wall. You'll find that a half dozen people can't push you against the wall. It's an old, yet favorite trick.

"FEATS of strong men all remind us—" no, that's wrong as far as quoting poetry is concerned! What we do want to say is that brains — not strength — is the prime need for all these stunts we see performed almost every day.

Take the case of a small 100-pound girl. She can resist the efforts of the strongest man who strives to lift her from the floor by getting him to place both his hands on her waist. Unnoticed and quite unconsciously her right hand rests on his left wrist and her left on the jugular vein region of his neck. With a slight outward pressure of the left hand and a gentle pressure downward with the right, the strong man's strength is deflected.

One of the most popular of lifting stunts is that of lifting a person in a chair without apparent effort. The person in the chair must be instructed in three important points before the trick can be successfully accomplished; the feet must rest firmly on the floor, the chair must be grasped firmly in both hands, and the body, legs and arms

Hold your index finger firmly against your nose. The strongest man can't pull it in an upward direction. The same holds true if you rest your hand on the top of your head, gaining leverage.

kept perfectly rigid. With these points thoroughly in mind you are ready to go ahead with the trick.

Here is what happens. When you rest your hands on the back of the chair and push outward the approximate 20-pound pressure you exert is taken up by the body of the sitter and multiplied several times. The chair rises several inches from the floor. The sitter's legs do the whole work.

A neat little stunt which shows the power of a single finger is the "five finger" lift. Two men place their index fingers under the instep of the medium, the third man puts his index fingers under the elbows while the fourth man puts his index finger

Need for STRENGTH Feats

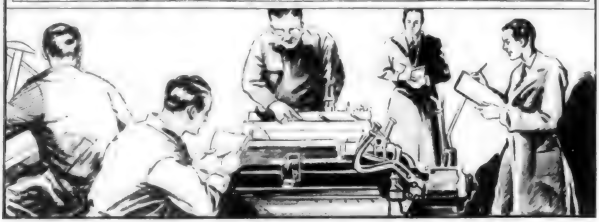
The "chest pull" is another favorite trick of strong men. Interlock the fingers of your hands and hold them on your chest with elbows extended to the side. The average girl can resist the attempts of two able-bodied men to pull them apart. The secret again is simple for the elbows are slightly lowered so the pull is downward.

By instructing the man to push directly forward, the girl, by exerting a slight upward pressure, can prevent herself from being thrown off balance. Here's what happens—the man exerts all his efforts in keeping the stick level, his strength going off in the air.

Get two men to clench their fists and hold them tightly together as shown. With a snapping movement from the index finger of both her hands the girl can force them apart. A sharp snap is necessary. The harder the men hold them together the easier it is to get them apart.

under the subject's chin. By lifting simultaneously the subject can be raised high up into the air without much effort. This can also be performed by having the subject lie on his back and placing the fingers on the back of the neck and behind the ankle.

MOTOR MECHANICS

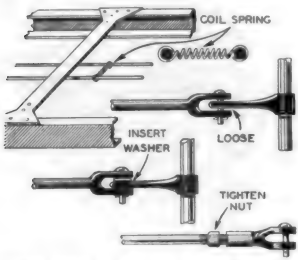


Edited by RAY F. KUNS

Everyone who owns an automobile is interested in keeping it in tip-top operating condition at minimum expense. Mr. Kuns, editor of this department, is well qualified to give advice on all phases of car maintenance. He is principal of the Automotive Trade School of Cincinnati, Ohio, and editor of the Automobile Digest.

Removing Squeaks and Disagreeable Rattles From Car

WHEN the car is new there is usually little annoyance occasioned by squeaks and rattles, but after it has been in use some time the paint which has helped to seal some of the joints wears off, connections become loose and a disagreeable rattling follows. Often the rattle can be traced to the brake rigging joints where a loose clevis, as shown in the drawing, explains the cause of the rattle. The best plan is to insert a washer as shown to eliminate the looseness.



Several points in the brake rigging assembly which may cause rattles are shown above, with methods of eliminating the annoying noises.

Check all lock nuts to be sure they are tight against the yoke. Brake rods frequently are passed through frame members with the result that uneven road surfaces and car vibration set up rattles. A coil spring hooked between the two rods as shown places a tension on them and eliminates the rattle.

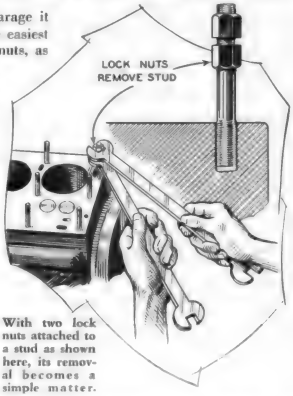
The use of penetrating oil has solved the problem of eliminating squeaky springs for many car owners. Some owners take their car to the service station the first of every month for such oiling, but you can easily perform the job yourself by purchasing a small can of the oil and spraying it onto the springs with a penetrating oil gun.

There are also a number of other points about the car where this oil should be applied. One of these is the under-part of the chassis and includes the spring shackles, car frame where the fenders, aprons, and other fittings are attached, the floor boards, body bolts, and similar points. The doors, door hinges, and certain other parts of the upper portion of the body may likewise be treated with the oil. About the engine there are also certain points which should receive attention to cut away gummed oil, such as the overhead valve system. A small amount of penetrating oil is also recommended for use in the crankcase of the engine as well as in the transmission and differential grease.

Lock Nuts Aid in Removing Studs From Engine Block

WHEN doing repair work in the home garage it is often necessary to remove studs. The easiest method of doing this is to make use of lock nuts, as shown in the drawing at the right. Place the flat surface of the nuts to come together squarely. Screw them down until they lock quite tightly. Then, holding a wrench on each nut in either hand, turn the stud out.

When studs are broken and the end is to be removed, center punch the center of the broken end, drill it with a bit slightly smaller than the diameter of the stud, and use an "easy-out." This is a tapered tool with a left-hand thread so that it draws into the hole more snugly as the wrench is used to turn the broken stud backward and out.



With two lock nuts attached to a stud as shown here, its removal becomes a simple matter.

Blowing Out the Gas Lines

EVERY seasoned motorist knows that the accumulation of lint, dirt and other foreign objects in the main gasoline tank is likely to find its way into the gas lines and clog them, resulting in a stalled engine. Open up the gas line at the fuel pump or the vacuum tank and use the hand tire pump as illustrated to blow the gasoline and accumulated dirt back through the supply line in the direction opposite to that in which the gasoline ordinarily flows.

Showing hand pump in use blowing out gas lines.

Treat each line in turn by this method and then remove the gasoline strainers from the vacuum tank and the carburetor and have them cleaned. Many motorists make a practice of draining their gasoline tanks every few months in order to get rid of the sediment which accumulates in them.

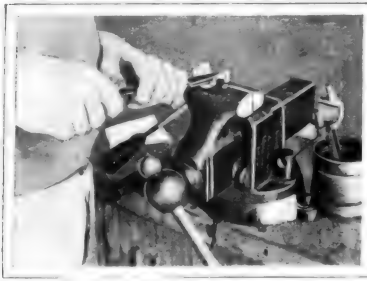
Attentions like this keep the fuel line system in tip-top shape and forestall annoying delays on the road.

Test the Differential Grease

WHEN the grease in your differential or transmission is filled with steel chips or cast iron cuttings its lubricating quality is naturally seriously affected. Such metal particles get into the grease in various ways. When the car is being manufactured cast iron cuttings are sure to be in the case, and when the job is assembled under production methods a careless inspection may fail to disclose them. Then there is the possibility that some part of the gear set is wearing away and causing the steel particles to find their way into the lubricant, where they are held suspended and ground around in the gears, causing rapid deterioration.

Every car owner can test the condition of his transmission grease for himself. Drain off some of the lubricant and insert in it a horseshoe magnet or one salvaged from a Ford or high tension magneto. If there are iron particles present they will adhere to the magnet when it is withdrawn from the bucket of grease, and their presence can easily be detected by washing away the lubricant from the magnet in a pan of gasoline. The filings, if present, will adhere to the magnet and indicate that the case should be flushed and drained.

Bearing Cap Not Damaged When Held Properly in Vise



Clamping bearing caps in vise as shown prevents injury.

MANY non-professional mechanics make the serious mistake of gripping the babbitt metal of the bearing cap between the vise jaws, with the result that it is badly crushed. The proper method of holding the cap is shown in the photograph at the left. Usually the back of the cap is so formed as to permit gripping it between the jaws of the vise, holding it securely without damaging the working parts in the least. When the edges of the babbitt metal are crushed by careless handling, the fit of the bearing is made imperfect and lubrication qualities are disturbed.

Checking Spark Plug Gaps Insures Better Operation of Auto Motors

WITH the advent of high compression engines a certain amount of spark plug and other ignition trouble has arisen. Where spark plug gap settings were formerly standardized at approximately .027″ to .032″, some manufacturers are now recommending that the spark plug gap be set at from .018″ to .022″.

Owing to the severity of the service conditions under which spark plugs operate, and the high voltage of pressure necessary to give a good hot spark, it is the usual thing to find that plugs which have been in service for a matter of 8,000 to 10,000 miles have had the electrodes burned. They burn away at an average rate of .001″ per thousand miles of driving. For this reason it is a good plan to have the plugs inspected occasionally and reset them when necessary. When resetting the spark plug gap, do not depend upon the eye but use a thickness gauge to measure and set all of them uniformly to the car manual recommendations or set the gaps to come within the limits of .018 to .020 for a high compression engine. Bend the outer wire to the inner electrode.

Device Eliminates Fog

LONDON, famous for its "pea soup" fogs, inspired the invention of the fog-eliminating device shown in the photo at the right. The device is known as the Foggon, and can be seen as a projection very much like a horn, installed beneath the right headlamp of the car in the photo. A warm air blast from the radiator is forced out of the horn by means of a high speed blower, and it is claimed that fog is removed from in front of the vehicle for a distance of from 10 to 15 feet. A. H. Lloyd, who with F. A. Wright invented the device, is shown installing it in the photograph.

The horn-like device beneath the headlight disperses fogs.

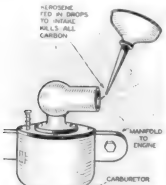
Ring Squeezers Aid in Installing a Piston in Cylinder

FOR installation of pistons a set of simple ring squeezers can be easily made as shown in the inset diagrams in the photograph at the right. For top installation a squeezer resembling the instrument used to twist open stuck tops on Mason jars can be made from a piece of strap iron ⅛ by ¾ inches, bent into the shape shown. This type of squeezer, however, cannot be used when installing a piston from the bottom of the cylinder. For such installation, make up a squeezer from a piece of 16 or 18 gauge sheet metal, as shown in the drawing, with a screw and nut for tightening. Place the piston rings on the piston; then place the squeezer over the rings and draw it snug. As the piston is forced up into the cylinder the squeezer is pressed downward over the piston and removed from the bottom.

Two types of ring squeezers are shown in drawings. Photo shows how they are used.

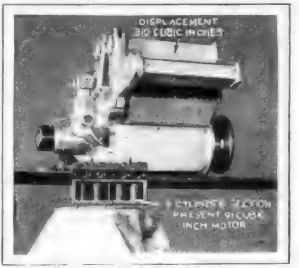
Removing Carbon from the Engine

YOU can remove the carbon from the "innards" of any gasoline engine by the method shown in the drawing below. Run the engine with open throttle, the spark being retarded to make it run hot. Fill a small oil can with kerosene and squirt a few drops at a time into the intake of the carburetor as shown. The results will be that carbon deposits are burned out. Kerosene consumes the carbon in more complete combustion. Be sure that you have plenty of oil and water in the motor before trying this stunt, as considerable heat is developed. This operation requires about ten minutes per cylinder for most engines. Thus the average six-cylinder car can be decarbonized in an hour.—Theodore Allen.



310 Cubic Inch Racing Motor

A REVOLUTIONARY new auto racing motor with a piston displacement of 310 cubic inches has been built by Harry Miller, famous race car designer, for Philip Chandler, a Santa Barbara, Cal., sportsman, at a cost of $18,000. The photo below shows the motor in comparison with a four-cylinder section from a 91" racing motor of the type used in racing up to this year. It is a supercharged job.



This racing motor was built by Harry Miller.

The Store on Wheels — What'll it Be?

THE day of the traveling baker, butcher or candlestick maker has arrived in full glory. Today, the peddler who formerly went from door to door has "gone specialist." By motor truck—yes, and by airplane—every known human need and desire is appeased by regular door to door service.

Let's look beyond the milkman, the butcher or the grocer and glance over the pictures on this page. They are "advance specialists" in merchandising methods.

Here is the floating soda fountain of Los Angeles ready to dispense cooling refreshments.

This traveling drugstore has done much to bring health-giving medicines to North Carolinians.

There is that enterprising dispenser of refreshments in Los Angeles. Daily he takes his traveling fountain around town serving cooling drinks and ices. The melodious tinkling of a deep-toned bell announces his approach—and perhaps you think those Angelenos don't take advantage of his service. They "eat" it up.

No less interesting is the motoring druggist who carries around on his truck everything necessary to compound medical preparations.

Then, there is that grocery store—wheeled and wing-equipped. The distributors of

Above we have a glimpse into the first aerial grocery store owned by a Chicago distributor of food products. It flies from place to place to give grocers an opportunity to see the firm's full line.

To the left is the traveling dental office that eases the pain of residents of Philadelphia and vicinity.

Monarch Food Products have an all-metal monoplane that jumps from place to place selling their wares to wholesalers.

Making the Screen Wire Tight Is Easy If You Know How

WITH oversize wire cloth or "screen" one should have no trouble making the wire so tight that when screen is laid flat the wire cloth will support a weight of several ounces placed in its center.

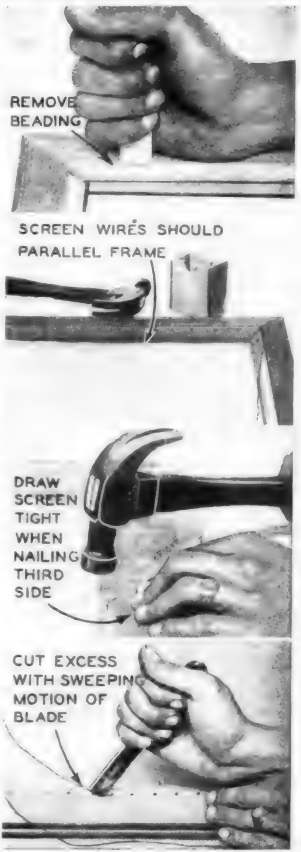
The beading or thin cover strip should first be removed. With new frames, the strip is easily taken off with a knife or chisel, running the blade along the separating line and biting deep into the wood at the same time.

Be sure to have the ends of screen square and oversize at least two inches. Squaring can be accomplished by tearing off the loose wires which separate at the ends. First tack one side of the cloth using tacks about a quarter of an inch long. Then tack the free end of the wire to the end of the frame, truing the screen by observing that wires run parallel to frame. A side and end will thus have been tacked on. The beading strip should not be applied yet, and no particular pains made during these two operations to get the screen tight.

The side opposite the first should now be tacked down, care being taken to draw the wire tight with the fingers, using the excess wire to offer grippage. With the wire being pulled by the fingers, and the wood frame being pushed by the end of the thumb, considerable tension can be put on the screen so that it will be very tight. The other hand now imbeds a tack into the frame and drives it home with the hammer.

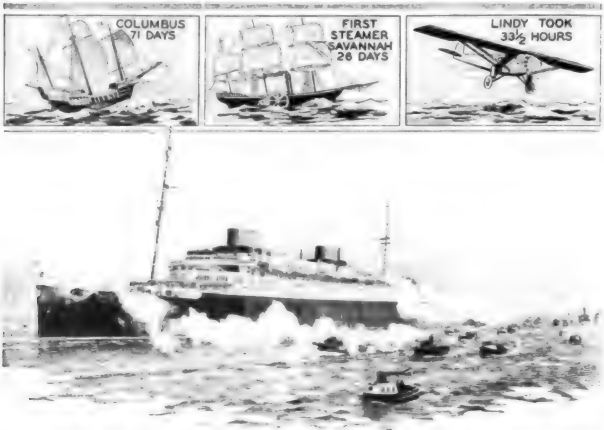
The last end of the screening is now tacked into place, pulling in the manner indicated. The surplus wire is cut off with a knife or chisel, with a rapid sweeping motion of the blade, and the covering strips applied with half inch wire nails such as are used on cigar boxes.

In painting screens it is advisable to thin out the paint fairly well to assure an even flow and eliminate clogging the mesh of the screen.



Pictures at the right show the graduated steps used in replacing screens. In removing beading, a knife or chisel may be used, care being taken not to break the strip. By placing tacks about an inch apart and keeping them in a straight line, wrinkling will be prevented when the screen is pulled tight. When drawing third side tight, care should be taken to see that wires are kept parallel. A sharp knife should be used to cut the excess screen cloth from the frame to prevent wires from being pulled.

Europa's Maiden Crossing



The Europa steams majestically out of Bremerhaven on her record breaking trip over the Atlantic under the command of Captain Nicolaus Johnson, Commodore of the North German Lloyd.

WHEN the giant North German Lloyd liner *S. S. Europa* steamed past Ambrose Light in New York Harbor a new record for speedy trans-Atlantic crossings was established. The *Europa* cut 18 minutes from the mark of 4 days, 17 hours and 24 minutes set by her sister ship, the *Bremen*, last October.

The *Europa*, like the *Bremen*, has the bulbous bow, a device which creates "dead water" at the propellers, giving to them a push which they could not get if the water were rushing by. Her exterior appearance, except for minor details, is identical with that of her sister ship. Her engines are high pressure steam turbines, the latest development in construction of high-speed vessels.

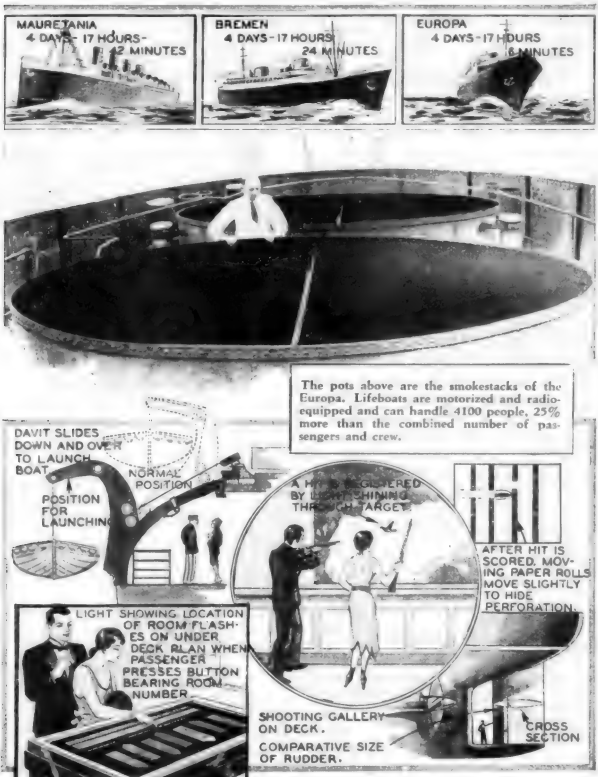
The overall length is 936 feet and breadth 101 feet. She will carry 2,200 passengers, as well as a crew of 975 men.

An unusual feature is her name in electric lights on starboard and port sides amidships. The letters are 6 feet high, illuminated by 1,200 bulbs which flash alternately. Flags also can be illuminated.

There are seven compartments for boiler and engine plants. The auxiliary machinery as well as generators and dynamos are located aft the main engine room. The main plant consists of two sets of turbines forward and two aft, each set, consisting of high, intermediate and low pressure turbines, being connected with one of the screws through single reduction gears which reduce the turbine speed of 2,100 r.p.m. to 210 r.p.m. of the propellers. The turbines are completely insulated against loss of teeth.

Steam is generated in oil fired water-tube boilers and electric power is generated by four large Diesel-driven dynamos supplying current to some 800 motors of various kinds. For emergency the plants are supplemented by 2 Diesel-driven dynamos.

Sets Trans-Atlantic Record



The Europa carries three anchors weighing 17 tons each. The chains total 2000 feet long and weigh 150 tons. The links have a diameter of 4 inches. A long wave and two short wave radios connect the ship to land. Phone connections around the world can be made from the new ship.

Home-Made Toy Monoplane Controlled Like Real Plane

Baby controls plane which runs on floor under own power.

LITTLE Roland Engler, of Pukwana, South Dakota, is the proud possessor of a beautiful gold and blue toy monoplane constructed by his father in spare time. Made entirely from home-made parts, with the exception of the motor which was taken from a washing machine, the plane will pull itself across the floor under its own power with its tiny pilot at the controls.

The little machine is practically a duplicate of a real airplane, having a propeller, dash switch, and a control stick which operates the tail wheel, elevator and rudder. Mr. Engler plans to make the affair even more realistic by rigging it up as a circular swing which may be maneuvered at will by the infant pilot.

Steel Rule Acts as Own Spring

THE steel rule pictured here is so flexible that it may be tied into a knot and yet rigid enough that it will not bend.

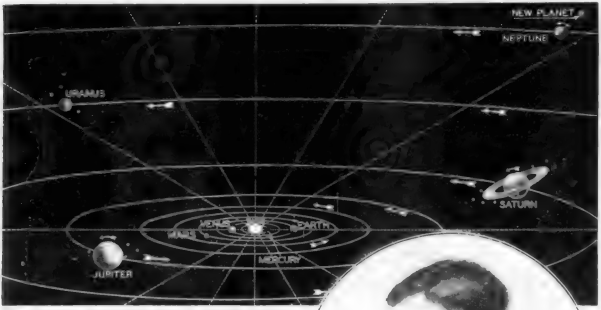
Asbestos Makes Cement Acid-proof

CEMENT is made acid-proof by coating with finely powdered pure asbestos made into a thick solution in sodium silicate. It is best to make the asbestos into a cake with a little of the silicate, and when using rub some off from the cake, adding more silicate as needed.

French Air Force Adopts Bullet-proof Plane Capable of 165 M.P.H.

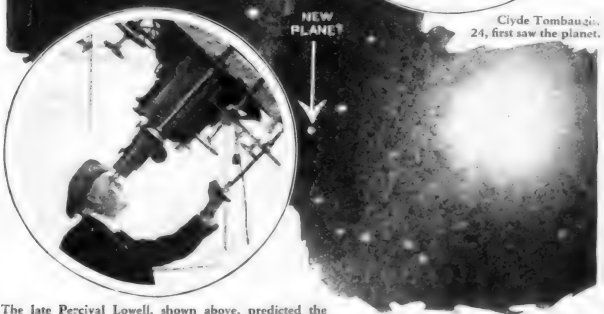
This all steel attack plane recently adopted by the French Air Force will do away with the old war-time hazard of having a wing or tail shot away in the air. Note the wide range of gun fire.

Astronomers Discover New Planet Out Beyond Neptune



The recently discovered planet, already named Pluto, is judged to be the same size as the earth.

Clyde Tombaugh, 24, first saw the planet.



The late Percival Lowell, shown above, predicted the planet's discovery 25 years ago. The picture of the planet was obtained with a 24-inch reflector and is from a 30-times enlargement of the plate. It was taken by Prof. George Van Biesbroeck of Yerkes Observatory at Williams Bay, Wisc. The bright glow on the plate is the near-by star, Delta Geminorum.

Archery

When first strung the bow will have a pull of 60 to 70 lbs. It is reduced by cutting the back.

MODERN Robin Hoods, bowyers of experience and bowmen of skill, work at their benches and practice target shooting in neighboring fields in all parts of the United States as a result of the recent revival of archery.

Archery is a utilitarian sport in that its enthusiasts eventually acquire skill in craftsmanship as well as in marksmanship. The expert archer prefers to make the primitive weapons which he uses. This type of construction is most exacting and there is a fascination about the work which challenges the skill and talent of the amateur artisan. There are some 500 archery clubs in this country and the roster of each organization includes at least several woodworkers who spend their leisure in making bows and arrows.

Most of these amateur bowyers labor in their home shops purely for pleasure but some have capitalized their skill and reap profitable returns from their hobby. A well-made lemonwood bow sells for from $8 to $10 while ordinary birch arrows in sets of 8 are worth from $0.75 to $1 a piece. Finer bows worth $25 or more and arrows valued at $2 to $3 apiece are also used by American archers. One amateur makes and markets 100 bows and about 100 sets of arrows annually. His income from this spare time shop work aggregates approximately $1500.

Lemonwood, yew, osage orange and dagame are the best hardwoods for bow construction. Lemonwood bows are satisfactory for beginners. The selection of imported wood of this variety of best quality and free from defects is of prime importance. The grain of the wood should be as straight as possible, free from knots and discolored places. The stave for a man's bow is 1⅛ inches square and six feet long and should be bright and clear in color. Its pull when completed will range from 30 to 40 pounds. Ladies and Boy and Girl Scouts use smaller bows made of staves seven-eighths inches square and 5 feet long with a pull of 20 to 30 pounds.

The back of the bow should be the strongest side as free as possible from imperfections and flat-grained. The bark side of the stave is best for the bow back if any bark is discernible. The middle of the bow is marked crosswise on all sides and then additional marks one inch above and two inches below this center are penciled—the handle of the bow. With a straight-edge, a line down the middle of the back of bone is next traced. Next lay off two lines at each end of the bow 5/16 inch from this median line. These marks limit the bow ends to a width of five-eighths inches. Lines are then drawn from the handle marks to the bow ends, a rip saw being em-

the How of It

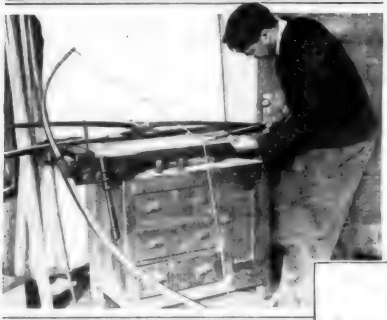
Accurately balanced arrows and perfectly formed bow, with just the right amount of pull and power, are the keys to true marksmanship. In following this modern Robin Hood at his work-bench you will discover how to make your archery outfit with a few simple tools and without the grief that comes from haphazard construction. You will enjoy making this set and the fun it will give you to say nothing of the training it provides.

The stave is 1⅛ inches square and six feet long. The handle is one inch above and two inches below center. Use a spoke shave for the arch.

ployed subsequently to shape the bow as much as may be with such tool. A block plane or spoke shave is then used to round the belly of the bow into a Roman arch, exercising care to keep both sides symmetrical. The design is such that the depth of the bow at all points is less than the width except at the handle where these dimensions are alike.

Eventually after considerable handwork, the bow is smoothed sufficiently so that the bowstring made of from 30 to 50 strands of durable well-waxed Irish linen can be strung. The bowstring is provided with a woven loop at each end. Two notches are cut slanting at an angle of 45 degrees on the sides of the bow one-half an inch from the end for the reception of the bow string. The back of the bow must never be notched or it will surely break. The terminal loops of the bowstring fit in these notches placed at both ends of the bow. In stringing the bow, the lower end with the loop in the notch is braced against the left instep of the archer. He holds the bow with its back in front of him, his left hand grasping the handle while his right bends the upper end of the weapon and presses the other loop of the bowstring into position. One of these linen bowstrings will last for three months where the archer practices shooting three to four times a week.

The lemonwood bow for a male archer will have a pull of from 60 to 70 pounds when first strung. The pull is reduced by locating the stiffest parts of the bow and cutting away wood at those points. This is done by use of a board called a tiller which is 1½ by 3 by 36 inches in dimension. This tiller is clamped securely in a vise, a notch is cut at one end to hold

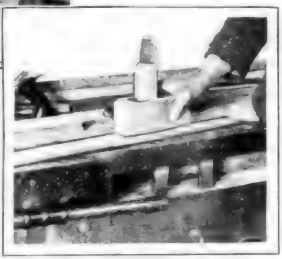


The bow should bend even to a 27-inch pull of 30 to 40 pounds. Any stiffness is removed by planing or with steel wool or sandpaper.

the bow handle while other small notches for the bowstring spaced one inch apart are cut between a point 15 inches from the bow-holding end and another spot 27 inches from that center. The bowstring is pulled back to the first notch. The arcs of each lateral one-half of the bow should be alike. These arcs are known as the limbs of the bow, the upper limb being 2 inches longer than the lower one. If they are not similar, the bowyer removes wood with cabinet scraper, block plane or spoke shave at the stiff points until they are uniform. The bow is then pulled to the second notch and the process is repeated. The repetition is continued until the bow will bend evenly to a 27-inch pull—the length of the ordinary archer's arm.

A spring balance is next employed in ascertaining the pulling power of the bow. More wood is removed, if necessary, until the pull is only two to three pounds more than desired. The preferable plan is to use the bow in target shooting or hunting for several months before finishing the surface of the weapon as the wood bends unevenly with strain as time goes on. Ultimately it should be worked down with steel wool or sandpaper and varnished or shellacked. The handle is usually made of tight cord windings or is covered with leather glued securely in place. An arrow plate of leather is embedded at the top of the handle where the arrow passes along the bow as drawn and shot.

Birch dowels for arrow making can be procured from practically any lumber dealer. Usually, they are crooked and have to be straightened by heating over a lamp or other flame. This must be done several weeks before the dowels which are 5/16 inches square

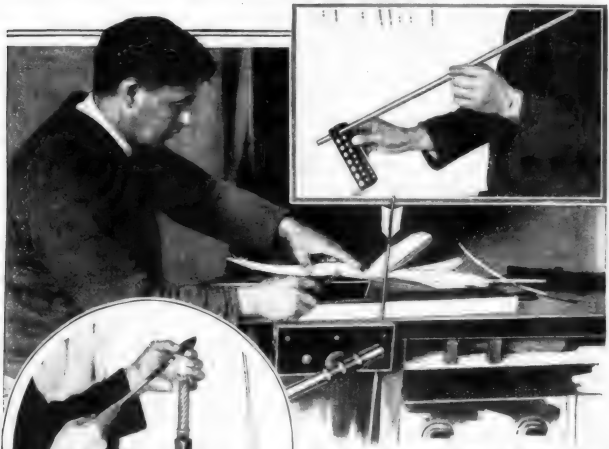


The bow should be flat-grained and free from imperfections. The bark side is best for back. Notches for string are cut on a 45 degree angle.

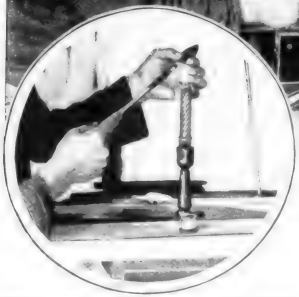
are shaped into arrows. Some producers specialize in selling straightened dowels to bowyers and it is advisable to buy such if they are available. One firm at Rome, New York, distributes them. The dowels are cut to a common length of 28 inches—the length of the average arrow. In fitting them with points, bullet casings purchased from cartridge manufacturers are most satisfactory. The bullet point is attached durably to one end with ferrule cement. Three hack saw blades mounted together in one frame are used in cutting the notch in the opposite end of the arrow for the bowstring. The arrow is sandpapered to proper dimension by use of a small block of wood provided with a groove lined with sandpaper.

The most difficult task is to fletch the

Arrows Must Not Vary in Weight or Marksmanship Will be Impaired



The shafts are made from birch dowels 5/16 of an inch square and 28 inches long. Extreme care is needed to fletch the arrow with feathers.



Bullet casings, attached to the finished dowels with ferrule cement, make the best arrow heads.

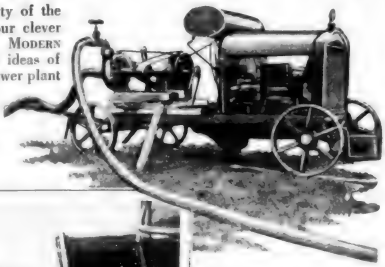
arrow head with the prerequisite feathers which give it its rifling for accurate flight. The pinion feathers from the wing of a turkey are best for this purpose. The feathers are stripped and then cut into 2½ inch lengths. The arrows to be fletched are sized with casein or animal glue or household cement. The cock feather is placed at right angles to the notch in the arrow head which fits the bowstring. It is held in position with steel pins until the adhesive dries. The other two hen feathers are placed so that they are 120 degrees apart. After the glue has dried, the feathers are trimmed to parabolic shape with sharp scissors. The average birch dowel arrow ranges from 350 to 450 grains in weight. The eight arrows in a set must not vary more than 2 to 3 grains each or shooting accuracy will be impaired. Each archer has a special crest for identification, such as a color combination of yellow, orange and red with black and white contrasts painted just below the feathers on each arrow. These colors are easy to see against the green turf where the arrow falls or "snakes" into partial concealment.

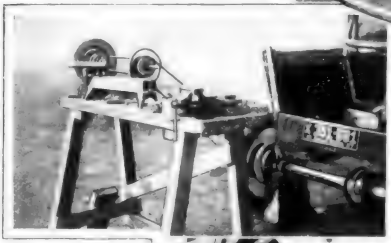
The archer also wears a leather bracelet on his left arm to protect the lower forearm from the recoil of the bowstring. It is usually a leather cuff which laces like a shoe—and can be made at home. The first three fingers of his right hand used in drawing the bowstring must also be protected with leather cots which cover the finger tips up to the first joint. They can be made from discarded handbags, pocketbooks and similar soft though durable leather. Some archers wear gloves on their

(Continued on page 188)

New Uses for Old FORDS

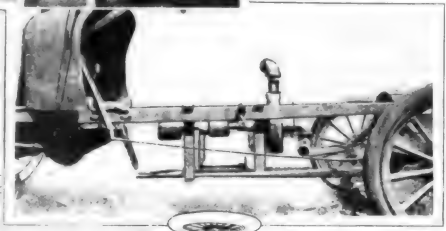
IT appears that the versatility of the old Ford has no end. Four clever and resourceful readers of MODERN MECHANICS have sent in their ideas of adapting the ancient flivver power plant to uses for which they were never designed but which they seem to be able to perform admirably. What new use have you found for your old Ford?

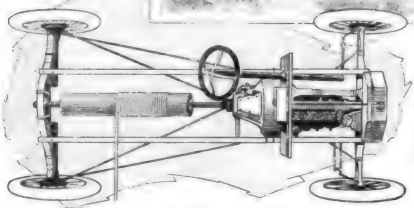




Above is shown an old Fordson tractor rigged up to furnish running water for the farm. An elevated water tank has been erected in the yard and may be filled by running the pump a few minutes a day, water being supplied by gravity through pipes to the house and barn.

Leroy Whitaker of San Francisco, California, rigged up this handy lathe in his back yard. A pulley has been placed inside the left rear wheel which transmits the power to the lathe by a leather belt. A block placed under the axle permits the wheel to turn.

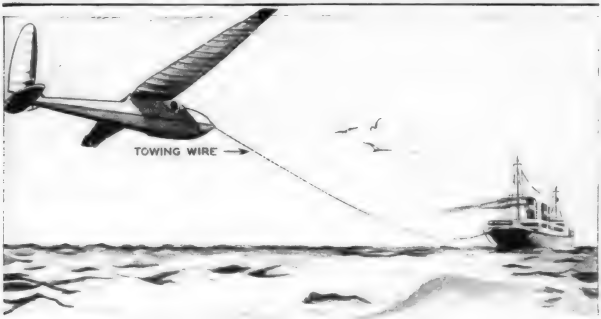




Another handy pump has been rigged up by John G. Barber of Dothan, Oregon. In this case the pump has been rigged up on the drive shaft of an old Model T Ford. The shaft has been cut off about half way and fitted to a small centrifugal pump which forces the water from a well to a tank erected above the roof of the barn.

Haakon Oppenboen of Van Hook, N. D., has placed a drum on the drive shaft and uses the device for hoisting coal from his mine.

Pair Planning Something New in Trans-Atlantic Flights



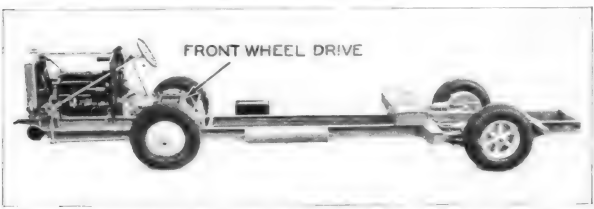
Mrs. Keith Miller and Captain Lancaster are planning a trans-Atlantic flight in a glider towed behind a liner. They plan to cross from Europe to America to take advantage of prevailing winds.

ALTHOUGH an east to west trip across the North Atlantic has been the nemesis of aviators with even the most powerful planes, Captain Lancaster and Mrs. Keith Miller plan to tempt fate this summer by crossing in a glider. Arrangements are under way to have the glider towed behind a fast liner. Prevailing west to east winds will favor a glider, which depends upon opposing winds to keep it in the air.

Interchangeable Front Wheel Drive and Transmission for Huge Busses

RECENT developments in the European automotive industry may soon make motors and chasses as independent of each other as were formerly the horse and wagon. German engineers have perfected a complete front wheel driving unit which may be unbolted from the frame in a few minutes, thus permitting either the motor or chassis to undergo repairs without putting the other unit out of operation.

Unlike the front wheel drive perfected in this country, this driving unit is placed ahead of the front wheels, making it an ideal arrangement for trucks and busses, where every inch of space is needed to carry the load.



This chassis is designed especially for double-deck busses. The motor is placed low on a straight underslung frame which eliminates much of the danger of tipping. The motor is interchangeable.

How Uncle Sam

by G. H. DACY

Uncle Sam dissects, weighs, bounces, batters and exposes baseballs to discover strength or weakness.

CONTROVERSIES have been so widespread on the liveliness of baseballs that Uncle Sam became interested and assigned scientists to the task of solving their riddles.

Laboratory baseball is "played" in the testing lab of the Department of Commerce where baseballs are dissected, weighed, bounced, battered and exposed to a round robin of tests.

Practical players say there is only one way of studying a baseball. It is to hammer the pellet until it becomes lopsided from punishment. Science, however, has evolved tests which provide similar results.

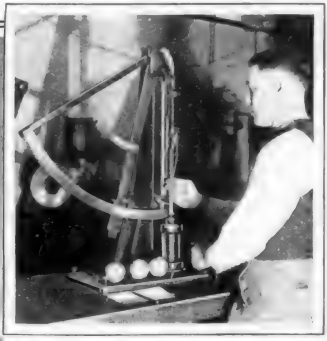
Government scientists discovered that defective lacing cords are the ball's Waterloo. The tough thread used in sewing the cover is the first to fail. The cords were tested by ascertaining how much force was needed to pull a single or double strand from the cover. Test balls were clamped in mighty machines. Steel hooks were inserted under the seams. Force measured by special spring balances was then exerted until the cords broke. The tests were repeated with other cords from new baseballs and subjected to tensile strength tests. A pull of from 31 to 46 pounds per strand was necessary to break the lacing cords in half dozen makes tested.

Balls of various makes are dissected and all materials weighed. The best weigh from 5 to 5¼ ounces and measure from 9 to 9¼ inches in circumference while the average weight is 144 grams. A league ball is composed of 67 grams of woolen yarn, 28 grams of horsehide cover, 27 grams of rubber core, 19 grams of cotton yarn and string including the lacing cords and first winding as well as 3 grams of sizing.

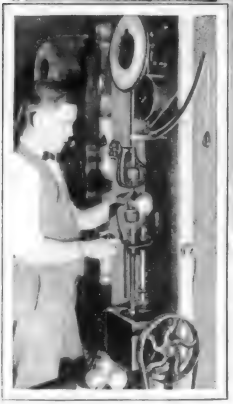
Increasing rubber content makes the ball sluggish and less resilient. The core now in use is vulcanized around a small ball of cork. The cork gives added resiliency. When Ruth's bat smacks one square and true, the outfielders sprint for the fences.

Rebound tests are reliable guides to liveliness. Science drops them from heights of five to ten feet in order to test resiliency, the distance of the rebound being measured in each case. The average rubber and cork center of the professional ball is livelier than the ball itself as demonstrated by comparative tests. The method employed in

Plays Laboratory BASEBALL



The testing device measuring the ball after it has been bounced about is shown above. The rebound measure is taken on both the ball and the core.



The thread breaking point varies between thirty-one to forty-six pounds.

wrapping yarn around the rubber core, the amount and quality used and the way the horsehide cover is sewed all affect resiliency.

The finest horsehide leather is used. Invariably the lacing will fail before this leather. In tensile strength tests, forces of 4000 to 9000 pounds per square inch were necessary to break it.

Los Angeles Boy Designs and Builds Speedy Monoplane

Paul Horner, 19-year-old youth, and the 340-pound monoplane which he built in his spare time.

PAUL HORNER, a nineteen-year-old Los Angeles youth, has designed and built a midget low-wing monoplane which embodies many novel features. Wind resistance has been reduced to the minimum through the complete elimination of all external wires and the streamline construction of all surfaces, while great strength is shown in the construction of the wings and fuselage.

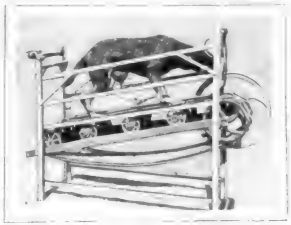
Steel springs have replaced the standardized rubber shock absorbers in the landing gear, and the tail assembly also shows several novel features. Horner constructed the tiny plane in his spare time.

Knockdown Decoy Easy to Carry

A PORTABLE knockdown decoy, a dozen of which may be nested together and carried in the coat pocket has been placed on the market. The head and floating bottom are attached to the sheet metal body with simple fasteners. The inventor claims the decoy has a lifelike appearance and is trouble proof.

It's a Dog's Life, This Reducing

DOWNTRODDEN husbands who have been forced to take Fido for an airing in the park may now breathe a sigh of relief, for the treadmill pictured here will enable the family pet to get all the exercise



Dogs do daily dozen without supervision on new mechanical exerciser, saving wear on husbands.

he needs on the back porch or the front lawn, and if the weather gets too severe he may do his daily dozen in the kitchen.

The contraption, which was first exhibited at the Los Angeles Dog Show, permits the dog to run for an hour without getting anywhere, and the proud owner may be sure that Fido will not get lost. If a rabbit passes by the dog has a good run while bunny stands around nibbling clover. A flywheel supplies momentum.

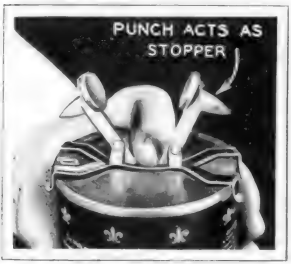
Launching Planes from Ships Is as Old as Aviation Itself

ALTHOUGH ship to shore mail, via fast planes, is now an assured fact, it must not be forgotten that launching planes from the decks of ships is as old as aviation itself. As far back as 1903 Langley launched his "Airdrome" from the deck of a houseboat in the Potomac River.

This photograph is evidence that in 1910 an experiment of launching an airplane from the deck of a ship was tried out at Cuxhaven. A rough super-deck was built over the poop deck of the liner "Pennsylvania," and on this deck may be seen the plane that was successfully launched.

An early experiment in launching airplane from deck of ship.

Device Keeps Canned Milk Fresh



Opener remains on can until contents are used.

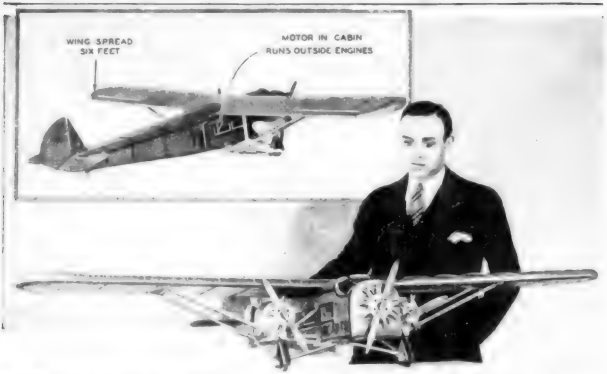
A NEW can-opener has been perfected for use with evaporated milk, maple syrup, or other liquids which are poured from the can. The device consists of a steel strip to clamp on the can. Back of these clamps are two sets of arms tipped with puncturing levers. When pressure is applied the points break through the head of the can, while pressure on the inside of the lever raises the points and permits pouring the liquid. Released, they seal the hole tightly again.

Crash Absorber Thrives on Bumps

SHOCK absorbers for road bumps have long been equipment within the reach of all, but Captain Franz Carl Schleiff, former German ace, has perfected a shock absorber to take care of head-on collisions. This is but one embodiment of Schleiff's revolutionary principle for killing living force in moving bodies. The bumper is made of solid rubber backed up by powerful shock absorbers.

The bumper transmits force to shock absorbers.

Model Airplane Demonstrates Uses for New Material



The "Micarta," a six-foot model airplane, actually flies under own power supplied by electric motors.

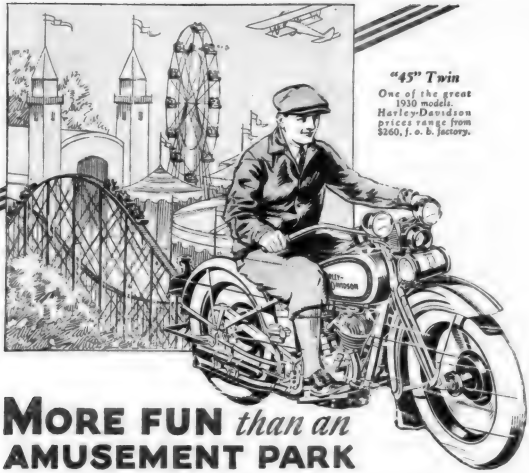
MICARTA, one of the recently completed experimental products of the Westinghouse laboratories, was used almost throughout in building this six-foot, trimotored model airplane. The model was not made to imitate any known plane, but was constructed by Westinghouse engineers to illustrate the many uses of the new material in airplane manufacture.

Manufacturers of the product predict that micarta will revolutionize the aviation industry, both in economy of construction and supplying a material capable of withstanding the severe strains which the modern airplane must meet in its performance. Micarta is made by impregnating a fabric base with phenolic resin and moulding it under pressure.

The wing and fuselage covering of the model plane is composed of micarta, and the material is also used in the tail wheel, struts, tail and elevator members, as well as in the streamlined wind shields. Three radial motors furnish power.

Built-in Dust-bin Opens and Closes Automatically at Touch of Broom

SWEEPING dust under the rug, an ancient right reserved for hubby when the wife is away but often preempted by the housewife herself, may soon become a thing of the past through the introduction of the built-in dust-bin which may be installed by anyone handy with tools. It is merely a 7 by 11 inch framework with a swinging door which opens to either a wall bin or a chute to the basement.



"45" Twin
One of the great 1930 models. Harley-Davidson prices range from $260, f. o. b. factory.

MORE FUN *than an* AMUSEMENT PARK

ALL yours with your Harley-Davidson Motorcycle — the dip and zoom of the "Roller Coaster", the thrilling whirl of the "Airships", the zip and speed of the "Whip"!

All yours to enjoy—every time you ride your Harley-Davidson — for motorcycling combines the thrills of a dozen sports in one. You never tire of it.

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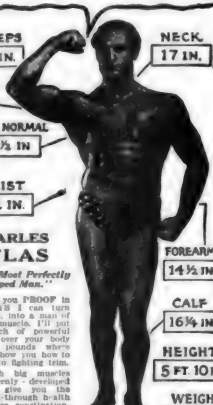

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(Please print or write plainly.)

Secrets of the Paris Gun

(Continued from page 50)

these, with a track down the center for the railway car. On either side additional railroad tracks carried a gantry crane of 175 tons capacity to handle the gun barrel.

When all was ready the railway trucks of the gantry crane were unloaded from their car on ramps provided for the purpose, and on them the gantry legs were set up and bolted down. Each gantry leg was topped by a jig crane, and with these the cross beam of the gantry was hoisted into place. Next the gun carriage, on its own wheels, was rolled onto the revolving turntable-like center section of the mount, a turn table that revolved on 96 steel balls 8 inches in diameter. Four powerful hydraulic jacks lifted up the carriage while the railway trucks were detached and rolled out of the way, then lowered it into place and it was secured to the turn table.

The gantry then picked up the 150 ton gun and swung it into place over the carriage. It took two weeks or more to prepare the emplacement and mount the gun.

Because of the complicated firing data, and the natural dispersement of the shots due to the extreme range, gun wear, wind drift, poor powder and other causes, only one target was ever used. That was the geographical center of Paris, a spot at the east end of the Palais de Louvre.

It is interesting that within an hour and a half after the first shell fell Allied officers had not only calculated the location of the gun but estimated the target on which it was laid probably was the "zero point" in Paris, the exact center of the Place in front of the Cathedral of Notre Dame, on the Isle de la Cite, in the Seine. The distance between the geographical center and the zero point is about one-half mile.

The location of the gun and the probable target were both calculated by charting the first seven shell bursts and drawing a line along the center on which they seemed to be falling. It is a curious thing that a number of shells fired from the same gun at the same target usually will be so equally spaced that if you draw a rectangle around all the bursts, and divide it with eight vertical and eight horizontal lines, 25 per cent of the shells will be found to have fallen within the first spaces on either side of the

(Continued on page 182)

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JOHNSON SMITH & CO., Dept. 956 RACINE, WIS.

Secrets of the Paris Gun

(Continued from page 180)

center lines, either up and down or across; 16 per cent in the next spaces; seven in the next and two per cent in the outer ones.

After the war when it became possible to talk to German officers, view the ground and consult German records we found just how effective the counter activity of the Allied artillery and aerial observers had been.

Five German long range guns were used at the St. Gobain woods position. One gun had burst while being fired and killed its own crew. Two positions, within the first week, had been shelled until they could no longer be occupied. A third was practically untenable when orders came to abandon it. The fifth gun fired just 64 shots before it was worn out. In five weeks 5,000 French heavy caliber shells fell on and around the gun emplacements. Toward the end they dropped as fast as 100 shells an hour. And in that five weeks the five German guns had fired just 183 shells in and around Paris!

Col. Edw. V. Rickenbacker and a 10-passenger Fokker

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CHARGES A NEW WAY

1—Who is Lieut. Omar Niergarth? **(See pages 92 and 69)**

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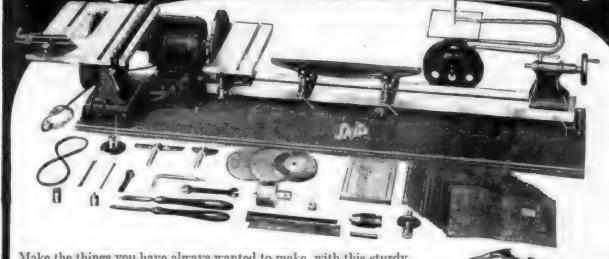

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Enclosed find 25 cents to cover your special offer for a sample Strength-O-Meter and a copy of "The Thrill of Being Strong."

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Letters from the Shop Mail Box

(Continued from page 40)

both ways. So—whoops, dearie! Get this one:

Pascagoula, La.

Dear Andy:

I like Modern Mechanics fine, all but what you say about radio. Short wave stuff is still a lot of fun. Don't kid yourself.

BILL JAMES DOOLEY

All right, all right—Billy, keep your shirt on. I know we aren't so long on the old fashioned kit type of how to build—nobody wants to be these days—but we have something new to uncork in short wave sets, and that's another one for the books.

Which reminds me: so far everything announced by the eds has been run in the mag, all prognostications fulfilled, with one exception, and that is the Flyin' Bathtub, which final analysis found would prove too heavy to fly, so—we commissioned Sam Rabl to design a twin floated plywood mono-plane to fly with a V twin engine, a sort of a motor glider to take its place. This will be run next fall when the windbite and shop work is the order of the day in the Hot Stove League.

WELL, Gang, the grass is turning greener out on the tarmac, and between you and me and the old gatepost, by the time this is in your hands I bet a cookie that Gene Shank and Westy Farmer have annexed the World's lightplane altitude record with the little Heath plane, MODERN MECHANICS' Pup, which is owned by Westy. Shank has the F. A. I. and N. A. I. qualifications and the barograph has arrived. All that awaits is favorable weather, and all that is needed to top the present official record is to better 5,100 feet. We'll report progress next month. Gene hopes for 12,000 feet, and a man with 6,000 hours like he has ought to know. He plans on taking two hours at daybreak when the weather's right. That's what I call sport!

Wish I had a little teeny 7 or 8 ft. dinghy to put the dinky boat engine in—the engine that is shown on page 186. I claim that'd be real steamboating, eh? The job is a four cycler, 1¼ in. bore by 1¼ in. stroke. Develops ⅛ to 1/3 h.p. and will turn up to 3,000 revs.

It'd take about 2,000 motors like that to move the Burney dirigible I see went

into last issue—incidentally another clean scoop for MODERN MECHANICS, that story. Wouldn't the Burney look like a whiskered whale with all those little mills buzzing around? And think of the control board. Haw! Some pipe dream this'n of mine, but not so Burney's idea. There is a *real* idee. Years later you can tell your chee-ild that you knew water dirigibles were comin' and that you saw the first one in a story in MODERN MECHANICS by one of the best dirigible designers of the day.

Here's a hot missive from an earnest typemill. What's your reaction to this tirade?

Victoria, B. C.

Dear Mr. Andy:

> I like your more or less rambling colyumn as you call it but quit tooting your horn or Modern Mechanics' horn because you don't know everything. Last week one of your admirers here took off in a Monocoupe and turned in a stall when barely off the ground. He's only seventeen, too. Something should be done to keep youngsters out of airplanes and dangerous autos.
>
> P. C. FORBES-WILSON

Pfft! Now, now, old-timer! Anyhow I'm glad you like this column—suppose I compliment you and nominate you for the presidency of the Something-Should-Be-Done Society. The mechanical kids of today will be the fellows who put industrial America on the map tomorrow. Says me!

AND by way of a parting shot till next month, Gang, let's tell you that Malc Pope and Dick Pope, the Florida outboard hydroplane bronco busters, have joined the Gang, and will have some stuff on outboard racing that, like all other M-M articles and stories, come from men who know their book. Lots of outboard stuff for the summer; race cars, too.

And say, if any of you want large size scale blueprints for *Allegra* for shop work, you can get them from Philip L. Rhodes, 103 Park Ave., N.Y.C., for five dollars. They are larger and a bit easier to read than those in the mag,—just like the plans in the book but larger. Phil will oblige you if you want them to mull over.

And maybe, speakin' of boats, you don't think the leetle *Sunray* by Sam Rabl, in this issue, is another natural, eh? Write, gang, and tell me what you'd like to see in this colyumn and in the book. I'll tell the eds—and how I will!

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ON APPROVAL

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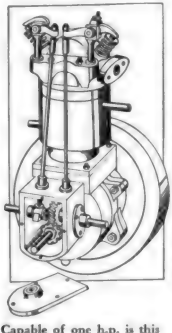
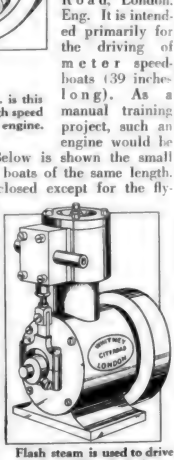


Capable of one h.p. is this little five-pound, high speed four-cycle gasoline engine.



Flash steam is used to drive this little fellow built by an English firm.

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Archery—The How of It

(Continued from page 171)

shooting hands. The shooting fingers of such gloves are reinforced with strong leather pads which replace the ordinary finger cots. The archer can make a quiver from heavy canvas or leather, providing a wire ring to hold the mouth of the case in proper position. A leather thong is attached for securing the quiver over the shoulder or around the waist. A carrying case for the bow can be made of heavy canvas or other weather-proof material which should be lined with cotton flannel. The arrows are best protected when not in use in a rectangular or cylindrical case with a perforated wooden core like that used for the storage of a set of metal bits. Each arrow must be kept separated from all others to prevent damage to the feathers.

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2—What city is the aviation capital of the United States? (See pages 92-100)

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3—What type of plane would you like to build? (See page 92)

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Putting Color Into the Movies

(Continued from page 57)

Now we come to the two relief map films. They are the matrices from which are to be made the hundred or more prints required for distribution to the theatres. With these two matrices ready, a black celluloid ribbon, which later is to become the film to be exhibited in the theatre, is treated with gelatine so that it readily will accept color dyes in liquid form.

Then the positive which bears the outlines, or microscopic hills and valleys, of the red matrix is brought in, soaked with a requisite amount of dye and applied like a master printing plate to this blank strip of gelatine-coated celluloid.

During this operation of transferring dye from the matrix to the blank celluloid both the matrix and blank are rigidly mounted on metal backings. The result is that the red parts of the image, or scene, are impressed or printed on the gelatine coated celluloid film and the latter drinks in from the red matrix all the color necessary to furnish the gradations of red required in the picture.

Processing the Positive

The same process is repeated with that strip of positive film which has been exposed to the green portions of the negative; that is, a green matrix is made from it in the same manner that the red one was made. This green matrix is later soaked with dye of a greenish cast and laid on the gelatine-coated strip of celluloid directly over the color which already has been imbibed from the red image—or scene.

Through this second application the gelatine coating now drinks in from the green matrix all the color necessary to furnish the required gradations or shades of green. Thus the gelatine layer is inter-penetrated with both dyes—red and green—in exactly the same proportions that those colors with their varying shades existed in the scene as originally photographed.

When this has all been done, these colors are "set" on the film and the result is a motion picture with every one of its many and diversified scenes all recorded in natural colors on one side of the film and ready for showing in a theatre.

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(Continued on page 192)

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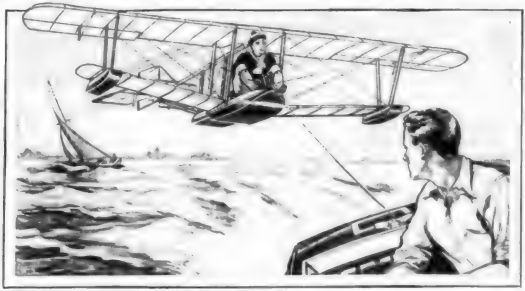

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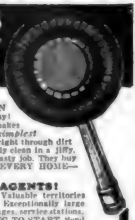

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Putting Color Into the Movies

(Continued from page 190)

film, theatre projection-machine operators are able to run a film in technicolor exactly the same as a black and white picture. No special appliance or any adjustment of the projection-machine is required.

Before the difficult problem of getting the color all on one side of the film had been successfully solved, technicolor was printed on both sides of double-coated film. This was thicker than ordinary film and operators in the theatre often failed to make the proper adjustment for the free passage of this double-coated film through their projection-machines. This resulted in the picture being out of focus sometimes. At other times blurred streaks were reproduced.

The finishing touches are being put on a new $1,000,000 technicolor plant in Hollywood, which will supplement two other laboratories in that movie colony and the two in Boston. In conclusion, I have found that each one of the faithfuls who pitched in for that original sink-or-swim fund of $140,000 has ridden the crest of the waves into the millionaire class today.

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4—Why are you entering this contest? (See page 92)

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5—What is an inclinometer? (See page 92)

The Church Mid-Wing Sportplane

(Continued from page 155)

disk, at the front of the motor cowling to hold the cowling. Fig. 2 should explain the propeller spinner sufficiently.

The Turtleback Fairing. The turtleback fairing should present no difficulty. The drawing of the first bulkhead is used as a start. There are three more bulkheads and a cross piece in front of the leading edge of the horizontal stabilizer. The height of these bulkheads can be scaled from Fig. 1, and their width is that of the fuselage at their position. They are fastened to the horizontal struts as shown in Fig. 4. Nine 1"x1/16" stringers complete the turtleback.

The Side Fairing. Two 1"x1/16" spruce strips are used on each side for side fairing. They are fastened as shown in Fig. 1. Their front ends fasten in a curved nailer fastened to the front vertical strut of the fuselage.

The Bottom Fairing. Fig. 1 shows the short bottom fairing. It is made of two false, curved, wooden longerons; two rectangular bulkheads and two fairing strips. Pretty but not essential.

Here are the parts listed in Figs. 5 and 6: 1, rear wing beam fitting; 2, front wing beam fitting; 3, air scoop for cooling rear cylinders; 4, gasoline lines from wing tanks; 5, rudder pedals; 6, rudder control cables; 7, altimeter; 8, oil gauge; 9, tachometer; 10, gasoline throttle; 11, choke; 12, ignition switch; 13, turtleback; 14, wing butt socket; 15, seat bottom minus cushion; 16, headrest pad; 17, windshield integral with top fuselage cowl; 18, hole through wind shield for aileron control cable between top horns of aileron.

All parts and large blueprints for the Church Mid-Wing Sport Monoplane conversion of the Heath Super Parasol can be obtained from James Church, 4844 Nevada Street, Chicago, Illinois, as well as all genuine Heath Super Parasol blueprints and parts for which Jim Church is an authorized agent.

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A Rubber-Band Flivver Car

(Continued from page 131)

need not be in one piece. ¾" is ample thickness. The top is screwed to the axle brackets with long stout screws.

The first axle assembly is in two pieces. Oak is recommended for these parts. The top piece is recessed on the front side to receive the ball race of an old Ford front wheel bearing. Ford bearings can be picked up at a junk-yard or can be bought new very cheap. The wheel axle is set in a groove on the lower side of the bottom piece. Slender wood screws will hold it in place. A length of ⅜" rod 18" long, threaded at both ends, will serve as a wheel axle. The hubs of the wheels may require other than ⅜" rod, but ⅜" is the standard on most coaster wagons.

A pivot bolt cannot pass completely through the two pieces, so a lag-screw and washers are used instead. It is necessary to drill a pilot hole for the screw, but care should be taken that the lag-screw screws in very tightly. A steering handle bracket is attached to the lower piece as with any coaster wagon. The upper piece should be braced to the top. Dime store shelf brackets will serve as braces.

Rear Axle Bracket

The rear axle bracket must be cut out as shown to receive the rear end of the rubber band motor assembly and the big bevel gear. The wheel axle is of ½" round rod turned down at the ends to ⅜" to receive the wheels. The wheel nut on the right side is drawn up tightly to hold the wheel rigidly on the axle. On the left side the lock-nuts are adjusted so that the wheel turns freely on the axle. The axle turns in bushings made of brass pipe clamped in a groove on the underside of the axle bracket. The clamp serves also as a brace. The gear is pinned to the axle with a small taper pin. A spacing sleeve between the frame of the rubber band motor and the bevel gear holds the gear in a fixed position and maintains a perfect line-up of the gears.

Rather than building the rubber-band motor to fit the car, it is better to build the car to fit the motor, so the dimensions and design given can be followed closely for any car. The group of drawings should make the construction obvious. The main frame must be made of fairly heavy stock to prevent buckling. When the rubber bands

(Continued on page 198)

California's Haystack Murder!

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Sheriff Reicks

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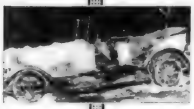

Murder Car

In the JUNE Issue of

Startling Detective Adventures

On SALE May 10th

June Cover

ALSO - - - In This Issue - - -

Trapping Brooklyn's Black Terror
By Nelson Robins

The Twin Cities' Double Slaying
By Wm. Robertson

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STED PITT, Dept. I-O, 153 Court Street, New Haven, Conn.

A Rubber-Band Flivver Car

(Continued from page 196)

are wound up tightly, several hundred pounds pressure is exerted against the stub axles. It is because of this excessive end thrust that ball bearings must be used. The cone of a Ford wheel bearing will have to be bushed to fit the ½" stub axle. A ½" pipe nipple, with a little filing, will serve as a bush. The grooved maple pulley is held firmly to the stub axle by drawing up the end nut tightly. The ratchet wheel can be made from a disk of soft steel. The ratchet teeth can easily be cut with a file.

The acquisition of suitable gears may be a problem. If one lives in a city there is usually a large hardware store which carries a variety of gears in stock, or one can write to a number of manufacturers who carry "stock gears." The bevel gears of a large breast-drill might be employed. Discarded gears may be picked up in a junk-yard or at a machine shop. With 12" wheels a gear ratio of 1½ to 1 is recommended but not absolutely essential. A 1 to 1 ratio can be used with 8" or 10" wheels. The large gear should be approximately 5" in diameter.

Different driving results can be had by using more or less rubber bands. The fewer, or the more narrow the bands, the greater number of turns can be had. This results in a longer coast without rewinding. If more and heavier bands are used the car will have more initial power and a quicker get-away, but the power is more quickly expended. A little experimenting by the builder will determine the size and number most suitable to his requirements. The bands should be rubbed occasionally with tire chalk or powdered graphite so that they slip over each other freely.

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On the Cover
GRETA GARBO

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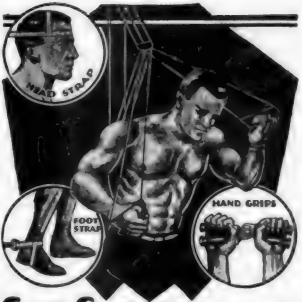

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Daring Death on Wings of Night

(Continued from page 83)

ordinarily burns about four minutes, which is ample time for a pilot to make a suitable landing. When you want a certain field lit up for your convenience drop the flare so that it will float with the wind over or near the field. Having dropped the flare, immediately turn around and make your landing underneath it.

"Of course, the situation is complicated when there is poor visibility. Your landing has to be made with much greater speed. But usually the flare is a splendid landing adjunct, lighting up the country-side for miles at a stretch. On a clear night you can pick out a field in a five-mile circle from the light a flare gives when dropped from a height of 1,500 feet.

"Night pilots have to do quite a bit of low flying. It is sometimes a choice either of flying very low or very high. The objection to flying high when going west is that we usually have to buck up against a terrific wind. However, as a general rule we fly low when headed west, thereby making better time, since the wind velocity usually is not so strong close to the ground."

Ernie Pyle, well known Washington, D. C. writer on aviation topics, recently got a letter describing a dramatic experience of his friend, Walter Brooke, in flying the 3,000-mile mail run of the Pan-American Airways between San Juan, Porto Rico and Paramaribo, Dutch Guiana. Several weeks ago, says Pyle, the cables carried a brief story of a plane being forced down at sea and being towed in by a Navy vessel. Brooke was the pilot and it was his second time down on the ocean between Porto Rico and South America. Says the letter:

"Yes, it was my ship, but it no longer flies. The strut fittings between the wings and hull parted in midair, and I did the only thing left to do—land mighty quick.

"Believe me, I don't want to make any more landings like that one. We hit the water nine times before we finally stuck. When we did stick, I didn't know for about five minutes whether or not we had any bottom left on the plane.

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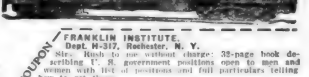

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Cracked Up in the Everglades

(Continued from page 71)

was yet many miles from home. The fisherman's hut was far better than the swamp, but there were none of the light foods and delicacies available which he ought to have had. The strong coffee and the dough balls made him deathly sick. Things looked bad. What was the use of struggling for hours without end through the slimy swamp if he was going to die from lack of food after getting out? He must get away from the hut, but where and how?

The following day searching planes flew over the hut. They dropped a message. It read, "Lieut. Niergarth's plane is located about ten miles south of your house, about a mile off the edge of the mangrove forests that line the coast. If possible, try to reach his plane and find out if he left any message as to what direction he took or where he was headed for when he left the plane."

The plane circled while Niergarth read the message, but there was nothing that he could do. He tried to let them know that he, Niergarth, was reading the message, but it was no use. In a few minutes the plane flew away.

The next day he heard the plane return. He rushed out in time to see a bundle drop from the plane. While he tried to reach the bundle another dropped. He opened one and found that it contained white panels. Here he had means of communicating with the plane but no code. Omar could do noth-

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ing but stand there helpless while the plane circled and then flew away. After it had gone, the fisherman brought him a note which the plane had dropped. It read, "Help us find Niergarth. If Niergarth is with you and well, place the strips on the ground in the form of one long strip. If Lieut Corkhill is there place the two strips in the form of an L. If neither one is there and you know nothing of the whereabouts of Lt. Niergarth place the strips parallel to one another. Searching Party."

If he had only received the message before the plane left! Perhaps other planes would come by and he could signal to them. Later in the day he was taken to a dredge farther out in the Gulf among the Ten Thousand Islands. The dredge captain realized his serious condition resulting from the heavy food received at the fisherman's hut and started Niergarth north in a motor boat.

Within a short time he was in a hospital and was receiving proper care and attention. He came through the ordeal without any permanent disability. Would he have been so successful had he stayed with his plane? Lt. Corkhill started south with an Indian guide as soon as the plane had been located. Would Corkhill have reached the plane in time? Maybe and maybe not. Be that as it may, Niergarth is one of those who advocate starting hiking if you have an even chance of reaching civilization.

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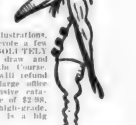

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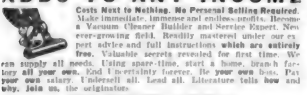

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Building the Sloop Sun-Ray

(Continued from page 127)

spar. The rope that performs the same duty for the jib is called the jib halyard. Ropes that trim the bottoms of the sails are called sheets and the sheets aboard our little packet are main and jib sheet respectively. The jib sheet is made double, one part leading to each side of the boat to save shifting the rope as the jib is shifted or as we will hereafter say trimmed from side to side.

While white cotton rope looks the nicest aboard a small yacht, manila or hemp is just as serviceable, and speaking of service there is no rope that is any cheaper or more serviceable than braided sash cord which can be picked up at the various salvage companies pretty cheap and will outlast any two other ropes but it is decidedly not yachty as it cannot be spliced nor is it adaptable to all the fancy knots dear to the heart of all experienced sailing yachtsmen.

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Deck fittings may be purchased to suit almost any pocketbook and while there is nothing prettier than polished brass fittings or anything that occasions any more work keeping them polished, there is nothing more serviceable than good old hot dipped galvanized fittings. Cuts of all the various types of fittings are included so that the builder may make his selection.

As to the sails let me say that sailmaking is an art that is not acquired with the making of one or a dozen sails and there is no piece of work so pretty as a job turned out by a professional sail maker, so take this part of the job to a professional and while there are several good books on sailmaking let us content ourselves with a working knowledge of the parts of a sail. The forward edge of a sail is called the luff, the after edge is called the leach, the bottom edge of the sail is called its foot and the top corners the clew or head.

To make the sail set flatter on the leach thin strips of wood are inserted in pockets and are called battens and somewhere up the sail you will notice a row or rows of small ropes hanging which are called reef points and whose function is to tie the sail down in a breeze when full sail would prove too much for the craft. This process of taking in sail is called reefing or shortening sail.

Thank You for Mentioning Modern Mechanics and Inventions for June When Writing to Advertisers

Painting is the last function to complete the craft and should be done in accordance with the directions for the particular type of paint that you intend using. I prefer the new quick drying paints lately put on the market although many people will advise against them. As to colors I like to see a fleet of one design boats all painted differently for the reason that colors will distinguish them when names and racing numbers are invisible. In this age of jazz the old order of a black or white yacht can be ignored and there is nothing so pleasing to the eye as a boat painted in warm glowing colors. Europe has painted her fishing craft thus for centuries and they are the subject of many an artist's masterpiece. However the color and paint that suits the individual builder is the best for his craft.

The old saying that a boat is never finished until she is sunk is as true as the best gospel and there is no time that little odds and ends of improvements are not in order and as she grows old patching starts. Keeping a boat in first class condition at all times should be a duty to all boat owners and there is nothing so disgusting as a slovenly kept yacht. As the old salts had it "keep her always shipshape and Bristol fashion." A boat's owner is judged by his craft, so act accordingly.

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6—Which flying school do you prefer and why? (See page 92)

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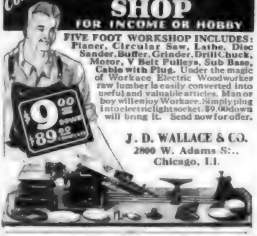

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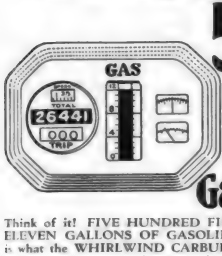

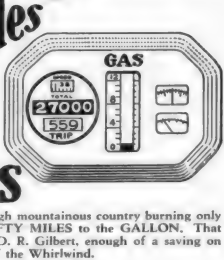

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of Modern Mechanics and Inventions, published monthly at Minneapolis, Minnesota, for April 1st, 1930.
State of Minnesota, County of Hennepin.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared W. H. Taylor, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Modern Mechanics and Inventions and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers, are:

Publisher: W. H. Fawcett, Robbinsdale, Minnesota.
Editor: Roscoe Fawcett, Robbinsdale, Minnesota.
Managing Editor, None.
Business Managers: W. H. Taylor, Robbinsdale, Minnesota.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

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3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above is: .....(This information is required from daily publications only.)

W. H. Taylor, Business Manager.

Sworn to and subscribed before me this 1st day of April, 1930.

LEON PILON, JR.,
Notary Public, Hennepin County, Minnesota
(SEAL) My Commission expires August 6, 1935.

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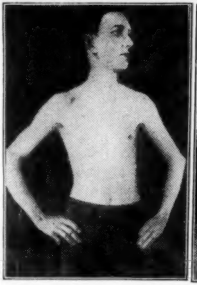

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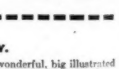

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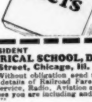

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